

<b>AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT</b>				1. CONTRACT ID CODE <div style="text-align: center;">J</div>		PAGE OF PAGES <div style="text-align: center;">1   15</div>	
2. AMENDMENT/MODIFICATION NO. 0001		3. EFFECTIVE DATE 24-Apr-2002		4. REQUISITION/PURCHASE REQ. NO. W22W9K-2056-4504		5. PROJECT NO.(If applicable)	
6. ISSUED BY USA ENGINEER DISTRICT, LOUISVILLE ATTN: CELRL-CT 600 DR. MARTIN LUTHER KING PLACE ROOM 821 LOUISVILLE KY 40202		CODE DACW27		7. ADMINISTERED BY (If other than item 6) PROCUREMENT BRANCH ATTN: LISA M. FRAZIER P. O. BOX 59 LOUISVILLE KY 40201-0059		CODE DACA27	
8. NAME AND ADDRESS OF CONTRACTOR (No., Street, County, State and Zip Code)				X		9A. AMENDMENT OF SOLICITATION NO. DACW27-02-R-0004	
				X		9B. DATED (SEE ITEM 11) 21-Mar-2002	
						10A. MOD. OF CONTRACT/ORDER NO.	
						10B. DATED (SEE ITEM 13)	
CODE		FACILITY CODE					
<b>11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS</b>							
<input checked="" type="checkbox"/> The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offer <input checked="" type="checkbox"/> is extended, <input type="checkbox"/> is not extended.							
Offer must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended by one of the following methods: (a) By completing Items 8 and 15, and returning <u>1</u> copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.							
12. ACCOUNTING AND APPROPRIATION DATA (If required)							
<b>13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS.</b> <b>IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.</b>							
A.THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.							
B.THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(B).							
C.THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:							
D.OTHER (Specify type of modification and authority)							
E. IMPORTANT: Contractor <input type="checkbox"/> is not, <input type="checkbox"/> is required to sign this document and return _____ copies to the issuing office.							
14. DESCRIPTION OF AMENDMENT/MODIFICATION (Organized by UCF section headings, including solicitation/contract subject matter where feasible.) Request for Proposal No. DACW27-02-R-0004 for Lock Construction, McAlpine Lock Replacement Project, Louisville, Kentucky, is hereby amended as follows:  SEE ATTACHED							
<small>Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.</small>							
15A. NAME AND TITLE OF SIGNER (Type or print)				16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print)			
15B. CONTRACTOR/OFFEROR		15C. DATE SIGNED		16B. UNITED STATES OF AMERICA		16C. DATE SIGNED	
_____ (Signature of person authorized to sign)				B.Y _____ (Signature of Contracting Officer)		23-Apr-2002	

Request for Proposal No. DACW27-02-R-0004 for Lock Construction, McAlpine Lock Replacement Project, Louisville, Kentucky, is hereby amended as follows:

1. **THE PROPOSAL DUE DATE HAS BEEN CHANGED TO 18 JUNE 2002. THE PROPOSALS ARE DUE BY 4:30 P.M. LOUISVILLE LOCAL TIME.**
2. The minutes of the Pre-Proposal Conference held on 17 April 2002 is hereby attached and made a part hereof.
3. The sign-in sheet for the Pre-Proposal Conference held on 17 April 2002 is hereby attached and made a part hereof.
4. The Bid Schedule of Section 00010 is hereby deleted in its entirety and replaced with the attached Bid Schedule (Amdt. #0001).
5. The PROJECT TABLE OF CONTENTS shall be DELETED in its entirety, and the attached PROJECT TABLE OF CONTENTS (Amdt. #0001) is substituted therefore.
6. SECTIONS 00115, 00130, 00800, 01312, 01335, 01451, 01500, 02130, 02210, 02217, 02226, 02240, 02822, 05093, 05400, 13202, 13502, 13504, 13505, 13532, 15010, 16263 and 16800 are hereby DELETED in their entirety, and sections with the same numbers (Amdt. #0001), attached, are substituted therefore.
7. SECTIONS 02463 AND 02840 are DELETED in their entirety.
8. The SUBMITTAL REGISTERS for SECTIONS 03151, 05400, 15010 and 16920 are DELETED in their entirety, and the attached SUBMITTAL REGISTERS for SECTIONS 03151, 05400, 15010 AND 16920 (Amdt. #0001) are substituted therefore.
9. The SUBMITTAL REGISTERS for SECTIONS 02463 and 02840 are DELETED in their entirety.
10. Wage Decision No. KY020027 dated 3/1/02 is hereby deleted in its entirety and replaced with the attached Wage Decision No. KY020027 dated 4/5/02 and incorporated herein.
11. The following CONTRACT DRAWINGS shall be DELETED in their entirety, and CONTRACT DRAWINGS with the same sheet reference numbers (Amdt. #0001), attached, shall be substituted therefore.  
  
Sheet Reference Numbers: X-1, X-2, X-4, F-24, C-3, C-7, C-12, C-19, C-26, C-42, C-43, C-44B, C-44D, C-47, C-48, C-50, C-52, C-54, C-62, C-72, C-73, C-77, E-8, E-8F, S-34, S-36, S-46, S-52, S-70, S-72, S-94, S-95, S-97, S-100, S-106, S-107, S-109, S-112, S-131, S-132, S-134, S-137, S-143, S-149, S-155, S-161, S-167, S-174, S-177A, S-177B, S-232, E-15A, E-21, S-262, S-268A, S-268B, S-274, S-276A, S-278, S-312, M-25, M-26, M-27, M-28, M-31, M-32, M-34, S-322, S-323, S-355, S-356, S-367, A-10, S-375, E-76A, M-40, M-41, M-43, M-44, M-45, M-46, M-52, A-12, A-13, A-13A, S-381, S-381C, S-381D, E-84, E-85, E-87, M-53, M-54, M-55, M-56, M-59, M-59A, M-59B, A-15A, S-382, S-382A, M-60, M-61, M-63, M-67, S-383A, E-97, M-68, M-69, M-71, M-74, S-383H, S-383K, A-26, E-106, S-385, S-401A, M-75 and M-77.
12. The CONTRACT DRAWINGS S-177D and S-177E shall be DELETED in their entirety.
13. This Amendment No. 0001 MUST be acknowledged as indicated in Item No. 11.

**BID SCHEDULE**  
**Amendment No. 0001**

ITEM NO.	SUPPLIES/SERVICES	EST. QTY	UNIT	UNIT PRICE	AMOUNT
	<u>DESCRIPTION</u>				
0001	Mobilization, Demobilization and Preparatory Work (Spec. Sect. 00800)		LS		\$ _____
0002	Removal and Storage of Salvageable Generators (Spec. Sect. 00800)		LS		\$ _____
0003	Storm Water Pollution Prevention Measures (Spec. Sect. 01356)		LS		\$ _____
0004	Core Hole Overburden Drilling (Spec. Sect. 02210)	1,000	LF	\$ _____	\$ _____
0005	Core Drilling, Vertical Holes (PQ) (Spec. Sect. 02210)	2,320	LF	\$ _____	\$ _____
0006	Core Drilling, Vertical Holes (NQ) (Spec. Sect. 02210)	500	LF	\$ _____	\$ _____
0007	39 - Strand Anchors (Spec. Sect. 02490)	600	LF	\$ _____	\$ _____
0008	Bar Anchors (Spec. Sect. 02490)	440	LF	\$ _____	\$ _____
0009	Grout for Anchors (Spec. Sect. 02490)	1,350	CF	\$ _____	\$ _____
0010	Redrilling for Anchors (Spec. Sect. 02490)	1,070	LF	\$ _____	\$ _____
0011	Preliminary Cleanup (Spec. Sect. 02217, 02226)	62,200	SY	\$ _____	\$ _____
0012	Final Cleanup & Foundation Preparation (Spec. Sect. 02217)	85,400	SY	\$ _____	\$ _____
0013	Allowance for Flooding and Evacuation (Spec. Sect. 02170)	1	EA	\$ _____	\$ _____
0014	Flooding Lost Time (Spec. Sect. 02170)	1	DAY	\$ _____	\$ _____
0015	Demolition (Spec. Sect. 02220)		LS		\$ _____
0016	Demolition of Bascule Bridge (Spec. Sect. 02220)		LS		\$ _____
0017	Demolition of Swing Bridge (Spec. Sect. 02220)		LS		\$ _____

ITEM NO.	SUPPLIES/SERVICES	EST. QTY	UNIT	UNIT PRICE	AMOUNT
0018	Demolition of Existing Cofferdam (Spec. Sect. 02221)		LS		\$ _____
0019	Rewatering Cofferdam (Spec. Sect. 02170)		LS		\$ _____
0020	Storage of Reusable Cofferdam Sheet Piling (Spec. Sect. 02221)	114,500	LF	\$ _____	\$ _____
<b>*1</b>	<b>0021 Not Used</b>				<b>*1</b>
0022	Conventional Rock Excavation (Spec. Sect. 02226)	67,000	CY	\$ _____	\$ _____
0023	Buffer Zone Excavation (Spec. Sect. 02226)	15,000	CY	\$ _____	\$ _____
0024	Special Excavation (Spec. Sect. 02226)	65,600	CY	\$ _____	\$ _____
0025	Excavation Adjacent to Structures (Spec. Sect. 02226)	3,155	CY	\$ _____	\$ _____
0026	Line Drilling (Spec. Sect. 02226)	62,000	SY	\$ _____	\$ _____
0027	Pre-Blast Survey (Spec. Sect. 02226)		LS		\$ _____
0028	Slurry Trench (Spec. Sect. 02261)		LS		\$ _____
0029	Stone Protection (Spec. Sect. 02270)	2,200	TON	\$ _____	\$ _____
0030	Grouting (Spec. Sect. 2270)	447	CY	\$ _____	\$ _____
0031	Earthwork (Spec. Sect. 02300)		LS		\$ _____
0032	Operation and Maintenance of Completed Work (Including Power, Maintenance, Monitoring and Repair for all Water Control, Instrumentation and Other Completed Work) (Sec. Sect. 02130, 02170, 13500)		LS		\$ _____
0033	Drilled Foundation Caissons (Bridge) (Spec. Sect. 02466)	5,990	LF	\$ _____	\$ _____
0034	Underdrains		LS		\$ _____

ITEM NO.	SUPPLIES/SERVICES	EST. QTY	UNIT	UNIT PRICE	AMOUNT
	(Spec. Sect. 02316, 02620)				
0035	Storm Drainage System (Spec. Sect. 02316, 02630, 03415)		LS		\$ _____
0036	Water Distribution (Spec. Sect. 02316, 02510)		LS		\$ _____
0037	Drainage Layer (Spec. Sect. 02714)	10,600	TON	\$ _____	\$ _____
0038	DGA Subbase (Spec. Sect. 02721)	12,800	TON	\$ _____	\$ _____
0039	Asphalt Binder Course (Spec. Sect. 02741)	1,280	TON	\$ _____	\$ _____
0040	Asphalt Surface Course (Spec. Sect. 02741)	1,300	TON	\$ _____	\$ _____
0041	Bituminous Tack Coat (Spec. Sect. 02748)	5	TON	\$ _____	\$ _____
0042	Bituminous Prime Coat (Spec. Sect. 02748)	12	TON	\$ _____	\$ _____
0043	Pavement Marking (Spec. Sect. 02763)		LS		\$ _____
0044	Fencing (Spec. Sect. 02821)		LS		\$ _____
0045	Vehicle Barriers (Spec. Sect. 02840)	190	EA		\$ _____
0046	Guardrail Systems (Spec. Sect. 02850)		LS		\$ _____
0047	Seeding (Spec. Sect. 02921)		LS		\$ _____
0048	Sodding (Spec. Sect. 02922)		LS		\$ _____
0049	Waterstop (Spec. Sect. 03151)		LS		\$ _____
0050	Reinforcing Steel, excluding Approach Walls (Spec. Sect. 03201)		LS		\$ _____
0051	Portland Cement, excluding Approach Walls (Spec. Sect. 03300,03701)	45,720	TON	\$ _____	\$ _____

ITEM NO.	SUPPLIES/SERVICES	EST. QTY	UNIT	UNIT PRICE	AMOUNT
0051AA	Portland Cement, excluding Approach Walls, All Over (Spec. Sect. 03300,03701)	4,572	TON	\$ _____	\$ _____
0052	Pozzolan, excluding Approach Walls (Spec. Sect. 03300,03701)	16,100	TON	\$ _____	\$ _____
0052AA	Pozzolan, excluding Approach Walls, All Over (Spec. Sect. 03300,03701)	1,610	TON	\$ _____	\$ _____
0053	Water Reducing Agent, First, excluding Approach Walls (Spec. Sect. 03300, 03701)	21,600	GAL	\$ _____	\$ _____
0053AA	Water Reducing Agent, All Over, excl. Approach Walls (Spec. Sect. 03300, 03701)	2,160	GAL	\$ _____	\$ _____
0054	High Range Water Reducing Admixture, First, Excluding Approach Walls (Spec. Sect. 03300, 03701)	1,300	GAL	\$ _____	\$ _____
0054AA	High Range Water Reducing Admixture, All Over Excluding Approach Wall (Spec. Sect. 03300, 03701)	130	GAL	\$ _____	\$ _____
0055	Air Entraining Admixture, First Excluding Approach Walls (Spec. Sect. 03300)	11,400	GAL	\$ _____	\$ _____
0055AA	Air Entraining Admixture, All Over 12,900 GAL Excluding Approach Walls (Spec. Sect. 03300)	1,140	GAL	\$ _____	\$ _____
0056	Anti-Washout Agent, First Excluding Approach Walls (Spec. Sect. 03300)	800	GAL	\$ _____	\$ _____
0056AA	Anti-Washout Agent, All Over 1,600 GAL Excluding Approach Walls (Spec. Sect. 03300)	80	GAL	\$ _____	\$ _____
0057	Structural Cast-in-Place Concrete, excluding Approach Walls (Spec. Sect. 03301)	15,750	CY	\$ _____	\$ _____
0058	Granite Obelisk (Spec. Sect. 04465)		LS	\$ _____	\$ _____
0059	Precast Concrete, excluding Approach Walls (Spec. Sect. 03415, 11175)		LS		\$ _____
0060	Mass Concrete (Spec. Sect. 03700)	217,500	CY	\$ _____	\$ _____

ITEM NO.	SUPPLIES/SERVICES	EST. QTY	UNIT	UNIT PRICE	AMOUNT
0061	Roller Compacted Concrete (Spec. Sect. 03701)	121,500	CY	\$ _____	\$ _____
0062	Dental Concrete/Mortar (Spec. Sect. 02217)	1,000	CY	\$ _____	\$ _____
0063	RCC Test Section (Spec. Sect. 03701)		LS		\$ _____
0064	Miscellaneous Concrete (Spec. Sect. 03301)	2,270	CY	\$ _____	\$ _____
0065	Miscellaneous Metals, Excluding Approach Walls (Spec. Sect. 05500, 05120, 05502)		LS		\$ _____
0066	Miter Gates (Spec. Sect. 05055, 05090, 05502, 11285)		LS		\$ _____
0067	Culvert Valves & Maintenance Bulkheads (Spec. Sect. 05055, 05502, 11287)		LS		\$ _____
0068	Floating Mooring Bitts (Spec. Sect. 05055, 11290)		LS		\$ _____
0069	Instrumentation (Spec. Sect. 13500, 501, 13502, 13503, 13504, 13505, 13507, 13527, 13532 )		LS		\$ _____
0070	Hydraulic Power Systems (Spec. Sect. 15010)		LS		\$ _____
0071	Raw Water System (05090, 05093, 11310, 15070, 15400)		LS		\$ _____
0072	Compressed Air System (05090, 05093, 15070, 15400)		LS		\$ _____
0073	Control Buildings (Spec. Sect. 03416, 04220, 06100, 06410, 07412, 05090, 05093, 07600, 07840, 07900, 08810, 08210, 08316, 08520, 08700, 08810, 09250, 09510, 09690, 09900, 10270, 10430, 10440, 10508, 10520, 10800, 11310, 11311, 13080, 13202, 15070, 15080, 15400, 15653, 15895, 15990, 15995)		LS		\$ _____
0074	Lock Electrical System (Spec. Sect. 16263, 16370, 16751, 16768, 16770, <b>16800</b> , 16900, 16910, 16920)		LS		\$ _____
<b>*1</b>	<b>Alternate 1: Approach Wall Drilled Shaft Design</b>				<b>*1</b>
0075	Government Furnished Sheet Piling for Approach Wall	11,000	LF	\$ _____	\$ _____

ITEM NO.	SUPPLIES/SERVICES	EST. QTY	UNIT	UNIT PRICE	AMOUNT
	End Cells (Spec. Sect. 02464)				
0076	Drilled Foundation Caissons (Spec. Sect. 02226, 02466)	495	LF	\$ _____	\$ _____
0077	Reinforcing Steel (Spec. Sect. 03201)		LS		\$ _____
0078	Portland Cement (Spec. Sect. 03300,03701)	3,000	TON	\$ _____	\$ _____
0079	Pozzolan (Spec. Sect. 03300,03701)	736	TON	\$ _____	\$ _____
0080	Water Reducing Agent, First (Spec. Sect. 03300, 03701)	3,900	GAL	\$ _____	\$ _____
0080AA	Water Reducing Agent, All Over (Spec. Sect. 03300, 03701)	390	GAL	\$ _____	\$ _____
0081	Air Entraining Admixture, First (Spec. Sect. 03300, 03701)	1,525	GAL	\$ _____	\$ _____
0081AA	Air Entraining Admixture, All Over (Spec. Sect. 03300, 03701)	153	GAL	\$ _____	\$ _____
0082	Structural Cast-in-Place Concrete (Spec. Sect. 03301,02132)	8,560	CY	\$ _____	\$ _____
0083	Precast Concrete (Spec. Sect. 03415)		LS		\$ _____
0084	Miscellaneous Metals (Spec. Sect. 05500)		LS		\$ _____
	<b>Alternate 2: Approach Wall Cell Design</b>				
0085	Government Furnished Sheet Piling for Approach Wall End Cells (Spec. Sect. 02464)	11,000	LF	\$ _____	\$ _____
0086	Government Furnished Sheet Piling for Approach Wall Intermediate Cells (Spec. Sect. 02464)	12,432	LF	\$ _____	\$ _____
0087	Contractor Furnished Sheet Piling for Approach Wall Intermediate Cells (Spec. Sect. 02464)	12,432	LF	\$ _____	\$ _____
0088	Reinforcing Steel (Spec. Sect. 03201)		LS		\$ _____



ITEM NO.	SUPPLIES/SERVICES	EST. QTY	UNIT	UNIT PRICE	AMOUNT
0089	Portland Cement (Spec. Sect. 03300,03701)	6,000	TON	\$ _____	\$ _____
0090	Pozzolan (Spec. Sect. 03300,03701)	1,200	TON	\$ _____	\$ _____
0091	Water Reducing Agent (Spec. Sect. 03300, 03701)	2,500	GAL	\$ _____	\$ _____
0091AA	Water Reducing Agent, All Over (Spec. Sect. 03300, 03701)	250	GAL	\$ _____	\$ _____
0092	Air Entraining Admixture, First (Spec. Sect. 03300, 03701)	1,780	GAL	\$ _____	\$ _____
0092AA	Air Entraining Admixture, All Over (Spec. Sect. 03300, 03701)	178	GAL	\$ _____	\$ _____
0093	Structural Cast-in-Place Concrete (Spec. Sect. 03301)	22,120	CY	\$ _____	\$ _____
0094	Precast Concrete (Spec. Sect. 03415)		LS		\$ _____
0095	Miscellaneous Metals (Spec. Sect. 05500)		LS		\$ _____
	TOTAL BASE BID (Items 1-74 plus either Items 75- 84 or Items 85-95)				\$ _____
	OPTION 1 – Reduction in cost for reusable cofferdam sheet piling becoming contractor owned material Reusable Cofferdam Sheet Piling (Spec. Sect. 02221)		LS		\$ _____
	OPTION 2 – Reduction in cost for salvageable generators becoming contractor owned material Salvageable Generators (Spec. Sect. 02221)		LS		\$ _____

ITEM NO.	SUPPLIES/SERVICES	EST. QTY	UNIT	UNIT PRICE	AMOUNT
	<p>OPTION PRICES SHALL BE GOOD FOR THE PROJECT DURATION IF AND WHEN EXERCISED. THE PROJECT DURATION WILL NOT BE AFFECTED BY THE EXERCISING OF THE OPTION.</p> <p><u>Special Proposal Conditions.</u> If a modification to a bid based on unit prices is submitted, which provides for a lump sum adjustment to the total estimated cost, the application of the lump sum adjustment to each unit price in the bid schedule must be stated. If it is not stated, the bidder agrees that the lump sum adjustment shall be applied on a pro rata basis to every unit price in the bid schedule.</p>				

Pre-Proposal Conference Minutes (held on 17 April 2002)  
McAlpine Lock Replacement Project  
Louisville, Kentucky

Introduction by George Flickner

Mr. Flickner also extended an invitation to attend the Networking and Marketing Opportunity being held in the Romano L. Mazzoli Federal Building Cafeteria starting at 1:00 p.m.

Lisa Frazier presented a brief statement on some of the requirements of the solicitation:

Reminder for everyone to complete the sign-in sheet  
The current proposal due date is 21 May 2002 by 4:30 p.m. local time.  
Verbal answers provided to questions presented at the Pre-Proposal conference are NOT binding.  
Section 100 contains a FAR Clause for Bid Guarantee/Bid Bond requirement is at least 20% of the proposed price, but shall not exceed \$3,000,000.00.  
Section 115 explains procedures for submitting proposals. An original and 7 copies are required.  
Section 130 contains information regarding CCR Registration. You MUST be registered in order to be awarded the project  
Section 700 contains FAR Clause indicating Davis Bacon Wage Rates apply to this project.  
Also in Section 700 FAR Clause indicating Performance and Payment Bonds for Construction are required.  
Both are 100% of the original contract price  
Reminder to submit all questions on the 3x5 cards, which were distributed to everyone

Larry Dalton conducted a Power Point Presentation of the McAlpine Lock Replacement project focusing on specific areas where work will be performed. A few of the highlights were:

The area is historically called Falls of the Ohio. Getting on island must cross existing two bridges. One is lifting for navigation. Navigation does have precedence. Storage and work areas were pointed out. Existing lock to be demolished by another contractor. Pedestal for swing bridge will remain for now to support bridge. Sills in the bottom of the locks (where the gates were) haven't been removed – lock contractor will excavate. Building of a new bridge is part of this project. Cofferdam will be removed by Lock Replacement Contractor.

Upon completion of the slide presentation, an invitation was presented to attend the Site Tour. Dave Klintiver provided a safety overview prior to the site tour.

**The following are questions which were submitted in writing at the conference and their responses:**

Will the Corps of Engineers consider extending the proposal due date? (There were 8 questions submitted regarding this issue)

The official extension notice date will be in the Amendment.

We registered as a contractor on your website over one month ago. We have not received any contract documents (i.e. Dwg Disc or Specs). When can we expect to receive them?

If you have registered but have not received the CD Rom, we need to know immediately. If you are coming to the district, we'll give you one only if you are registered.

For Joint Ventures, LLC's, or other bidding ventures involving 2 or more firms. How are the representations & certifications to be handled? Do we submit one copy for each member of the venture or one combined form?

Yes, submit Reps & Certs for each company. CCR should be registered as the J/V Company. You can either use the Tax I.D. from the dominant company, or request a new Tax I.D. number for the J/V Company.

Must the blasting specialist be an independent consultant or can he be an employee of the prime or subcontractor?

Does not have to be independent consultant. Can be employed by the prime or subcontractor and must meet qualifications and be licensed.

Mobilization pay item – Can bond costs be reimbursed under this item for 100%? If not how will these be reimbursed? Can insurance costs be reimbursed under this item for 100%? If not, how will these be reimbursed?

Yes, there is a Line Item for Mobilization which is where you would put your cost.

Will the core samples be available for viewing today or tomorrow? If so, where?

Core samples are being stored in a warehouse in Indiana. Meet tomorrow (18 April 2002) at the McAlpine Resident Office if you are interested in going to view the samples. A government representative and all interested parties will leave MRO at 8:00 a.m. The storage area is unheated and poorly lit, but supplemental lighting will be provided for the visit. There will be a sign up sheet to record those in attendance. A Corps of Engineers van will be available for transportation to the warehouse. The samples are stored on pallets and may not be easily accessible. Information regarding the Core Samples are referenced in Section 02130, Paragraph 1.91 and Section 02226, Paragraph 1.3. Arrangements can also be made by contacting Steven Hite at (502)315-6503.

Will we be quoting Corp of Eng directly for hydraulic power units and cylinders, or quoting to other subcontractors?

You will not be quoting to the Corps

The two NTPs are not a fixed line apart. How will the contractor be compensated for delays to the 2<sup>nd</sup> NTP after Jan 1, 2003?

Will be negotiated. First of January on site presence possible. Dave Klintiver will be in constant contact with the current contractor and meet on a weekly basis in order to facilitate the schedule of work.

Will we be able to come back for additional visit of site? If so, who do we contact?

Contact Dave Klintiver at Resident Office (502)772-3492 Ext. 7480 or Charlie Haddaway at (502)772-3492 Ext. 7481

If welders are certified thru our company to ASME Section 9 will they have to be re-tested for this project?

Must have current certification for the welding procedures identified in the specifications.

Will a pre-bid attendance list be sent with addendum?

Yes, the list will be attached as part of the amendment.

Transportation/Hauling of equipment for McAlpine project bid opportunities?

Yes, prime responsibility to decide how work to be performed. Register on the web site and use the lists provided to market to prime.

It appears both the concrete and rebar for the CIDH drill shaft foundations pay in the drilled shaft item and the structural concrete and rebar bid items?

Will research and if this needs fixing, it will be addressed in the amendment.

The measurement & payment spec for the cast in drilled hole (CIDH) or caisson section refers to other bid items for payment means. However, these referred to bid items are not shown in the bid form?

Will research and if this needs fixing, it will be addressed in the amendment.

Are there any advantages for Prime contractors to use minority 8a contractors?

It is to your advantage to choose subcontractors with the minority/women percentage requirements. Your proposal will be evaluated on your subcontractor plan. You must meet the goals.

Funding? One million for this year is funded. The numbers aren't known for next years budget. We will fund it and keep it moving. When the project is awarded, it will be continuously funded.

How long will it take to evaluate the proposals? Depends. The normal process usually involves several days for contracting to prepare items for the board. The board is selected and the process starts, usually 2 weeks if there is no discussion needed. Documentation could drag out the process another month or two. The proposals do not sit on our desks for weeks untouched.

Can we get a copy of the sign in sheet today? No, we don't have the facilities here to do that. It will be on the web in the amendment.

What is the process for evaluating bids? Is there a point system for goals met with women and minority subs? Or does low bid get the project? AFAR has Appendix DD. A point evaluation system is used to evaluate the subcontractor plan. You must have greater than 70 points to get a satisfactory rating. The selection process is based on best value. Technical score is evaluated with price. We start with the highest technical score and see where they rank in price. If this is also the lowest price, then it is a no-brainer. If not, we continue to look at the best value trade off. Adjective ratings are used for all factors but the subcontracting plan. The final rating is not an exact point score; it is an adjective that describes the rating such as exceptional or satisfactory.

END OF QUESTIONS.

# SIGN-IN SHEET

Pre-Proposal Conference for the  
McAlpine Lock Replacement Project  
McAlpine Lock and Dam, Louisville, KY

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## Amendment #0001

### SECTION 00115

#### PROCEDURES FOR SUBMITTAL OF PROPOSALS

The procedures for the submission of all proposals shall be as specified in this section.

1.1. Where to Submit. Offerors shall submit the below-listed number of proposal packages to the Corps of Engineers at the address shown in Section 00010, Block 8 of Standard Form 1442, Room 821.

1.2. Submission Deadline. Proposals shall be received by the Corps of Engineers no later than the time and date specified in Section 00010, Block 13 of Standard Form 1442. All information requested by Sections I through VII must be submitted for the proposal to be considered.

#### \*1 1.3. Participation of Commercial Firm.

a. The following firm may provide administrative support during the source selection process. This firm will be authorized access to only those portions of the proposal data and discussions that are necessary to enable them to perform their respective duties. The firm shall be expressly prohibited from competing on the subject acquisition and from proposal scoring, ranking, or recommending the selection of a source:

**FIRM: CATALYST**

b. Pursuant to Federal Acquisition Regulation (FAR) 9.505-4, individuals involved in this acquisition whose duties expose them to proprietary information generated in an offeror's proposal will be required to sign a nondisclosure agreement. This agreement states that, while performing their duties related to the source selection process, they will: (1) protect the offeror's information from unauthorized use or disclosure for as long as it remains proprietary and, (2) refrain from using the information for any purpose other than that for which it was furnished. \*1

\*1 1.4. Submission Format and Number of Submittals. All proposed materials shall be submitted in binders with a table of contents and tabbed section dividers. The sections should parallel the submission requirements identified below. Sections I-III and V should be submitted in original and seven copies. \*1  
\*1 Sections IV and VII should be submitted in original and two copies, **Section VI should be submitted in original and seven copies, and these three sections** should be placed in a separate envelope. Offerors are hereby informed that all evaluation factors other than cost or price, when combined, are approximately equal to cost or price. \*1

Section I. Experience. (Tab I)

A. Individual Personnel Experience (Tab I-A).

Identify and provide a resume for all key personnel to be assigned to this project, including the Project Manager, Project Engineer, Project Superintendent, Quality Control System Manager, Corporate Safety Officer, Project Safety Engineer, and Superintendents for all major subcontractors. If more than one shift of work is planned, provide a resume for the Safety Engineer, Superintendent and Quality Control System Manager to be assigned to each shift. If blasting is planned for the work, identify the Licensed Blaster. Include respective authorities, areas of responsibility, current workload and the percent of time they will be made available for this project. Indicate under specific experience the role each individual had in any project examples cited. The Quality Control System Manager must meet the requirements in Section 01451. Offerors may use the attached format for resumes. \*1

\*1 B. Relevant Project Experience (Tab I-B). \*1

\*1

**Provide information demonstrating knowledge, skill, and experience of prime contractor or subcontractors doing the following type work:**

**\*1**

- Construction and overall management of major marine and bridge facilities
- Operation and Maintenance of Dewatering Systems
- Operation and Maintenance of Concrete Batch Plant Facilities
- Production and Placement of Roller Compacted Concrete
- Fabrication and Placement of Precast Concrete Elements
- Construction of Drilled Caissons into Rock
- Placing Mass and Structural Concrete and Reinforcement
- Installation and Prove Out of Automated Control Systems
- Fabrication, Installation and Operation of Lock Operating Machinery Including Hydraulic Cylinders, Hydraulic Power Units, Hydraulic Control Systems, Lock Control Systems, Transformers and Switchgearing
- Fabrication and Installation of Miter Gates and Tainter Valves

**\*1**

**\*1**

**\*1**

For each of the above tasks provide description(s) of a project(s) of comparable scope and complexity that demonstrate the prime **contractor and/or subcontractors'** knowledge, skill, and experience.

**\*1**

**\*1**

**C. Working Relationships (Tab I-C).**

**\*1**

**\*1**

Provide **information** showing past working relationships between the prime and the subcontractors for this job, including Joint Ventures and Partnering experience.

**\*1**

Section II. Past Performance. (Tab II).

Provide references for all of the experience identified in A, B, and C of Section I above. Reference information should include project name, location, owner's name, point of contact and current telephone number. Also include any ratings, letters, awards, etc. which support past performance on these projects. For the projects submitted, in the area of Past Safety Performance, provide the following information:

**\*1**

**\*1**

1. Workman's Compensation Experience Modification Insurance Rating. (Provide documents from Insurance Company to verify rating.)

**\*1**

**\*1**

2. Frequency Rates of Lost Workday Cases for the last (5) years with a comparison to **Corps** standards.

**\*1**

**\*1**

**\*1**

**In the area of Past Performance on Utilization of Small Business concerns identify your efforts to comply with Federal Acquisition Regulation (FAR) Clause 52.219-8, Utilization of Small Business Concerns. If you are a large business, provide details of efforts on previous projects containing subcontracting plans that clearly represent your efforts to comply with FAR Clause 52.219-9, Small Business Subcontracting Plan. Information is to be limited to projects performed within the past five years.**

**\*1**

Section III. Technical Approach. (Tab III).

This solicitation requires no submission of formal drawings. However, offerors may submit drawings or sketches to demonstrate any required information in regards to technical approach.

A. Method of Concrete Production and Placement. (Tab III-A)

Provide a description of the method(s) of delivery of all materials used in the production of conventional concrete, the location and layout of the batch plant(s), method(s) of conveyance and placement of conventional concrete to the locations where conventional concrete will be placed, a schedule or sequence for all major conventional concrete placements for the project and the various types of conventional concrete (Mass Concrete, Ready-Mixed Concrete, etc.) to be used in each location. The description of the location and layout of the batch plant(s) shall include the principal components of the plant(s), laboratory,



offices, and shop and storage buildings and areas. The information shall also indicate the type, size, make, model and capacity of the batch plant(s). Give the storage areas and/or facilities for all components used in the production of conventional concrete and the volume, rated capacities and anticipated capacities of the areas and/or facilities. If it is anticipated that cooling plant(s) will be used, information such as layout, location, make, type, size, rated capacity, and anticipated production rates shall be provided.

Provide the names and experience (if not given under I.B) of the Subcontractors who will be responsible for this work.

#### B. Method of Roller Compacted Concrete (RCC) Production and Placement. (Tab III-B)

Provide a description of the method(s) of delivery of all materials used in the production of RCC, the location and layout of the pug mill(s), method(s) of conveyance and placement of RCC to the locations where RCC will be placed, and a schedule or sequence for all major RCC placements for the project. The description of the location and layout of the pug mill(s) shall include the principal components of the mill(s), and any associated shop and storage buildings and areas. The description shall also indicate the type, size, make, model and capacity of the pug mill(s). Give the storage areas and/or facilities for all components used in the production of RCC and the volume, rated capacities and anticipated capacities of the areas and/or facilities.

Provide the names and experience (if not given under I.B) of the Subcontractors who will be responsible for this work.

#### C. Methods for Fabrication, Installation and Prove Out of Controls. (Tab III-C)

**\*1** Provide a description of how the controls will be fabricated and installed. Also, describe the procedure that will be followed to prove out the controls. **\*1**

Detail how required materials will be delivered to the site.

Provide the names and experience (if not given under I.B) of the Subcontractors who will be responsible for this work.

#### D. Procedure for Construction of Approach Walls.(Tab III-D)

Provide a description of how the approach walls will be constructed. Included the Contractor's chosen alternative for construction of the approach walls. Describe the methods and equipment to be used to construct the foundation system including the scheme for obtaining the positional accuracy required. Provide a description of the construction methods for the precast elements required for this project. Provide the location of the facility that will be used to construct the precast elements. Indicate if the precast elements will be fabricated by the prime contractor, a subcontractor, or a manufacturer. Describe how the precast elements will be delivered to the site. Describe the methods and equipment to be used to place the precast elements. Describe the measures the Contractor will use to minimize impacts to lock operations as well as the navigation industry during construction of the approach walls. In addition, outline the safety concerns related to the construction of the approach walls and the measures that will be taken to eliminate those safety concerns.

Detail how required materials will be delivered to the site.

Provide the names and experience (if not given under I.B) of the Subcontractors who will be responsible for this work.

#### E. Procedure for Construction of Access Bridge. (Tab III-E)

Provide a description of how the access bridge will be constructed. Describe the methods and equipment to be used to construct the drilled shafts that will support the bridge. Provide a description of the construction

methods for the precast elements required for this project. Provide the location of the facility that will be used to construct the precast elements. Indicate if the precast elements will be fabricated by the prime contractor, a subcontractor, or a manufacturer. Describe how the precast elements will be delivered to the site. Describe the methods and equipment to be used to place the precast elements including how the bridge beams will be placed across the existing lock chamber. Describe the measures the Contractor will use to minimize impacts to lock operations as well as the navigation industry during construction of the bridge. Outline the safety concerns related to the construction of the bridge and the measures that will be taken to eliminate those safety concerns.

Detail how required materials will be delivered to the site.

Provide the names and experience (if not given under I.B) of the Subcontractors who will be responsible for this work.

#### F. Methods for Fabrication and Installation of Miter Gates and Tainter Valves. (Tab III-F)

Provide the location, size/capacity of the facility that will be used to fabricate the gates and valves. Indicate if they will be fabricated by the prime contractor, a subcontractor, or a manufacturer. If the final assembly, weld test and final painting are not at the fabrication facility, identify the location. Describe the method of transportation proposed.

Provide a description of the method of lifting, installing and constructing the gates and valves at the project site. Identify the proposed location of floating or land-based plant, all major risks involved in the proposed methods of installation and the plans for mitigating those risks. Describe proposed methods and locations of storage of the gates and valves or components thereof at the project site.

Provide the names and experience (if not given under I.B) of the Subcontractors who will be responsible for this work.

#### G. Methods for Fabrication, Installation and Operation of Lock Operating Machinery. (Tab III-G)

Provide a description of how the lock operating machinery will be fabricated, installed and operated. Include in this description the lock electrical systems. Describe the methods and equipment to be used to place and adjust the lock operating machinery. The offeror shall submit with their proposal, brand/manufacturer's (include manufacturer's location) information citing capacity and knowledge in the design and manufacture (include information on comparable designs and manufactured products) of the specific lock operating machinery listed below:

Hydraulic Cylinders and Mountings  
Hydraulic Power Units with Valve Manifolds  
Hydraulic Control Systems  
Transformers, Switchgears and Motor Control Centers

Detail how required materials will be delivered to the site.

Provide the names and experience (if not given under I.B) of the Subcontractors who will be responsible for this work.

#### H. Site Layout. (Tab III-H)

Provide a plan describing how the site will be utilized. Describe what areas will be used for storage, parking, material lay down, concrete and RCC batch plants, office space and equipment. Detail the proposed limits of tree removal. Provide a description of any river off load sites. Describe what avenues will be used for construction traffic, deliveries and any anticipated rerouting of through traffic. Describe how contractor personnel will make access to the site. Describe how any required utilities will be brought into and across the site.

#### Section IV. Price Proposal (Tab IV)

Offerors will provide a price proposal in a separate envelope. Each offeror shall submit Standard Form 1442 and Section 00010, Proposal Bid Schedule, in an original and two copies. In accordance with FAR 15.304(e) all evaluation factors when combined, are approximately equal to cost or price.

#### Section V. Project Management (Tab V).

##### A. Organizational Chart (Tab V-A).

Provide an organizational chart for this project showing home office support, on-site management, and the responsible chain of command including levels of authority. Joint venture offerors shall show the respective areas of responsibility for each partner. Include names of assigned personnel and subcontractors and their respective areas of responsibility. Elaborate on home office engineering and procurement support for the project. Clearly delineate on-site from off-site personnel.

\*1

\*1

\*1

##### B. Network Analysis (Tab V-B).

\*1

Submit a summary network analysis (utilizing software described in section 01320) showing how the work will be performed and completed based on the duration shown in Special Contract Requirement (SCR) No.1.3, Commencement, Prosecution and Completion of Work. The analysis must acknowledge the conditions noted in Section 00800 SCR 1.11, Physical Data and 1.31, Sequence of Work. The schedule should be sufficiently detailed to show the Contractor has a complete understanding of the project's requirements; it shall be generated using the guidance of section 01320, except that manpower and equipment resource loading and cost data are not required; it shall indicate planned work hours/shifts/days by the use of different calendars. This schedule shall indicate the Contractor's proposed contract duration if different than specified. A minimum of 200 activities should be included with this schedule. Because of the time constraints of the proposal evaluation period, it will be required that the Contractor submit paper printouts of all Primavera data used in generating the schedule such as calendar definitions, activity code structures, etc. Primavera backup disks along with the paper printout shall be submitted with this submission.

\*1

\*1

##### C. Sequence of Work (Tab V-C).

Submit a brief narrative description of how major milestones will be accomplished. Include what work will be done in the wet and what will be done in the dry. Also, include the estimated manpower levels, equipment to be utilized, number of shifts, and number of workdays per week to accomplish the work in the major milestone durations.

\*1

#### Section VI. Subcontracting Plan. (Tab VI)

\*1

\*1

Large business offerors shall submit a subcontracting plan in accordance with Section 00700, FAR 52.219-9 and DFAR 252.219-7004. To be acceptable, plans must adequately address the required statutory elements and provide sufficient information to enable the Contracting Officer to answer affirmatively questions A through H of Appendix DD, Part 2, AFARS 19.705 (**attached**). Percentage goals apply to the total amount being subcontracted. The current goals for the Louisville District are 61.4% to Small Business, 9.1% to Small Disadvantaged Business, 2.5% for HubZones, 5.0% to Women-Owned Small Business, and 3.0% to Veteran Owned and Service Disabled Veteran Owned Small Business. NOTE: THE SUBCONTRACTING PLAN WILL BE EVALUATED.

\*1

#### Section VII. Performance Capability Information. (Tab VII) (NOT EVALUATED)

A. The offeror shall submit Section 00600, Representations and Certifications

B. Proof of Financial Ability (Most recent financial statement covering assets and liabilities)

- C. Other pro forma requirements indicated in Standard Form 1442 and this section
- D. Number of years firm has been in business
- E. Name, address and telephone of the firm's bank
- F. Name, address and telephone of the firm's bonding company
- G. Information showing offeror's bondability for this project. Include the bond rate.
- H. Name, address and telephone of two credit/trade references

**\*1**      **1.5. Technical Evaluation and Rating of Proposals.** Offerors are advised that the technical evaluation and rating of proposals are conducted in strict confidence in that technical evaluation personnel review and rate each proposal without knowledge of the price offered. Offerors are required to segregate their cost and pricing information. **\*1**

**\*1**      **1.6. General Proposal Submittal Information.** **\*1**

a. Offerors submitting proposals for this project should limit submissions to data essential for evaluation of proposals so that a minimum of time and monies will have been expended in preparing information required herein.

b. Offerors shall certify that all items submitted in proposals comply with the requirements of the Description/Specification. The criteria specified in this RFP are binding contract criteria and in cases of any conflict, subsequent to award, between RFP criteria and contractor's submittals, the RFP criteria shall govern unless there is a written agreement between the Contracting Officer and the contractor on the waiving of a specific requirement.

c. Clarification of this Request for Proposal. Any explanation desired by an offeror regarding the meaning or interpretation of the RFP shall be requested in writing and received by the Contracting Officer not later than 14 days prior to the closing date of this solicitation. Any interpretation made will be in the form of an amendment to the RFP, and will be furnished to all prospective offerors. Receipt of all amendments must be acknowledged in the space provided on the proposal form, by letter or on the amendment form and received by the time set for receipt of proposals.

**Amendment #0001**

SECTION 00130

PROPOSAL EVALUATION SYSTEM

1. STATEMENT OF WORK. The contractor shall construct the lock and access bridge for the McAlpine Lock Replacement Project in accordance with the provisions set forth in the Request for Proposal (RFP) and in the contractor's proposal thereto.

2. GENERAL. An evaluation team will be established to evaluate each proposal in response to this RFP. The technical and non-technical aspects of each proposal will be evaluated.

3. PROPOSAL EVALUATION CRITERIA. Proposals will be evaluated in accordance with the following criteria, listed in descending order of importance.

- a. Experience.
- b. Past Performance.
- c. Technical Approach.
- d. Project Management.
- e. Subcontracting Plan.

3.1. Description of Proposal Evaluation Criteria. Proposals will be technically reviewed by qualified evaluators to initially determine basic conformance with the RFP, e.g., minimum acceptable compliance with applicable codes, standards and specifications. Further evaluation will establish a relative order of merit among proposals in accordance with the following:

\*1

a. Experience. This factor is broken into three subfactors. **These subfactors are listed below in descending order of importance.** The Government reserves the right to check any or all cited references to verify supplied information and to assess owner satisfaction. The Government may also use other tools to gather information regarding an offeror's qualifications and past performance.

\*1

A. Individual Personnel Experience. The evaluation team will evaluate the adequacy and strength of key personnel assignments to cover the necessary construction staffing requirements. The evaluation team will also evaluate for compliance with specified minimum requirements, degree of qualification and experience, familiarity with local conditions, etc. The personnel assigned in the proposal must be utilized on the project. Substitution of any proposed personnel requires prior written approval of the Contracting Officer.

\*1

B. **Relevant Project Experience.** The evaluation team will evaluate both the extent and quality (past performance) of **relevant** experience. Documentation of successful completion of projects similar in nature and scope to this project will be favorably considered in the evaluation. Conversely, proposals that do not include substantial evidence that the offeror has experience, qualifications and production capability to successfully prosecute the proposed project will be unfavorably considered.

\*1

\*1

**Recent experience may be considered more favorably than older experience.**

\*1

\*1

C. **Working Relationships.** The evaluation team will evaluate the relationships with the proposed subcontractors on past projects. Proposed subcontractors with no prior relationship with the prime contractor will be rated lower.

\*1

b. Past Performance. The Government will evaluate the degree of successful completion of all experience identified in A, B and C above. The Government reserves the right to check any or all cited references to verify supplied information and to assess owner satisfaction. The Government may also use other tools to gather information regarding an offeror's qualifications and past performance. Proposals providing evidence of awards, accommodations, etc., will be looked upon more favorably than those

*1	without. The evaluation team will rate the past safety performance of the Contractor based on the following: The Workman's Compensation Experience Modification Insurance Rating number will be compared with the normal industry frequency rate of 1.0. If Workman's Compensation Experience Modification Insurance Rating number submitted with the proposal is equal to or lower than 1.0, the proposal may be scored more favorably than a proposal with a Workman's Compensation Experience Modification Insurance Rating number rating exceeding 1.0. Frequency rates of lost workday cases for years 2000 and 2001 will be compared with <b>Corps</b> standards for those same two years; frequency rates higher than <b>Corps</b> standards may be scored less favorably than frequency rates that are equal to or lower than <b>Corps</b> standards. <b>In regards to past performance on Utilization of Small Business Concerns, the evaluation team will rate the past performance of the Contractor in complying with Federal Acquisition Regulation (FAR) Clause 52.219-8, Utilization of Small Business Concerns and FAR Clause 52.219-9, Small Business Subcontracting Plan.</b>	*1
*1		*1
*1		
*1	c. Technical Approach. The technical portion of the proposal consists of eight areas. <b>These areas are all equal in importance.</b>	*1
	A. Method of Concrete Production and Placement. The evaluation team will evaluate the proposal regarding the contractor's level of understanding of the procedures required to produce and place conventional concrete in the required locations. Procedures and equipment will be evaluated for impacts on operation of the existing facilities, navigation and the surrounding community. Proposals that minimize these impacts may be considered more favorably. The evaluation team will evaluate the proposal regarding the capability of the methods and equipment to meet the required contract duration as well as required product quality.	
	B. Method of Roller Compacted Concrete (RCC) Production and Placement. The evaluation team will evaluate the proposal regarding the contractor's level of understanding of the procedures required to produce and place RCC in the required locations. Procedures and equipment will be evaluated for impacts on operation of the existing facilities, navigation and the surrounding community. Proposals that minimize these impacts may be considered more favorably. The evaluation team will evaluate the proposal regarding the capability of the methods and equipment to meet the required contract duration as well as required product quality. The proposal will also be evaluated for the level of experience of the planned participants. Proposals with a high level of experience in working with RCC may be scored more favorably.	
	C. Methods for Fabrication, Installation and Prove Out of Controls. The evaluation team will evaluate the proposal regarding the contractor's level of understanding of the procedures and equipment required to fabricate, install and prove out controls. The proposal will also be evaluated regarding the contractor's understanding of the difficulties and complexities associated with the proving out of lock controls.	
*1		*1
*1	D. Procedure for Construction of Approach Walls. <b>The two approach wall alternatives will be evaluated as equals.</b> The evaluation team will evaluate the proposal regarding the contractor's level of understanding of the procedures required to construct the approach walls. The evaluation team will evaluate the proposal regarding the capability of the proposed methods and equipment to meet the required positional accuracy of the foundation system. The evaluation of the plan describing precast element construction methods will be based upon the offeror's understanding of the potential difficulties entailed at each step of these particular construction processes, and the offeror's proposed methods for successfully completing each of these key portions of the project. The evaluation team will evaluate the proposal regarding the contractor's level of understanding of the potential difficulties of transporting and handling the large precast elements and the contractor's proposed methods for mitigating potential problems. The evaluation team will evaluate the proposal regarding the contractor's level of understanding of the potential difficulties of placing the large precast elements and the contractor's proposed methods for mitigating potential problems. Procedures and equipment will be evaluated for impacts on operation of the existing facilities, navigation and the surrounding community. Proposals that minimize these impacts may be considered more favorably. The proposal will also be evaluated for the level of experience of the planned	*1

participants. Proposals with a high level of experience with the construction methods planned may be scored more favorably.

E. Procedure for Construction of Access Bridge. The evaluation team will evaluate the proposal regarding the contractor's level of understanding of the procedures required to construct the access bridge. The evaluation team will evaluate the proposal regarding the contractor's level of understanding of the potential difficulties regarding the drilled shaft construction and the contractor's proposed methods for mitigating potential problems. The evaluation team will evaluate the proposal regarding the contractor's level of understanding of the potential difficulties of transporting and handling the large precast elements as well as placing the elements. Procedures and equipment will be evaluated for impacts on operation of the existing facilities, navigation and the surrounding community. Proposals that minimize these impacts may be considered more favorably. The proposal will also be evaluated for the level of experience of the planned participants. Proposals with a high level of experience with the construction methods planned may be scored more favorably.

F. Methods for Fabrication and Installation of Miter Gates and Tainter Valves. The evaluation of the plan describing fabrication, handling, transportation and construction methods will be based upon the offeror's understanding of the potential difficulties entailed at each step of these particular construction processes and the offeror's proposed methods for successfully completing each of these key portions of the project. The proposal will also be evaluated for the level of experience of the planned participants. Proposals with a high level of experience with the construction methods planned may be scored more favorably.

G. Methods for Fabrication, Installation and Operation of Lock Operating Machinery. The evaluation team will evaluate the proposal regarding the contractor's level of understanding of the procedures and equipment required to fabricate, install and operate lock operating machinery. The proposal will also be evaluated regarding the contractor's understanding of the difficulties and complexities associated with positioning and adjusting of lock operating machinery. The proposal will be evaluated for the level of experience of the planned participants. Proposals with a high level of experience in fabricating, installing and proving out controls may be scored more favorably.

H. Site Layout. The evaluation team will evaluate the proposal regarding the contractor's level of understanding of the physical limitations of the site as well as the limitations stated in the RFP. The proposal will also be evaluated for impacts on operation of the existing facilities, navigation and the surrounding community. Proposals that minimize these impacts may be considered more favorably. Proposals that minimize the physical changes to the site may also be considered more favorably.

- |    |   |    |
|----|---|----|
| *1 | d. Project Management. The evaluation team will evaluate the <b>three</b> areas shown below. <b>These areas are all equal in importance.</b>  | *1 |
| *1 | A. Organizational Chart. The evaluation team will evaluate the clarity, adequacy, capabilities and strengths of the offeror's organizational chart for managing a successful project.   | *1 |
| *1 | B. Network Analysis. The evaluation team will evaluate the schedule to assess the strength of understanding of events required to complete this project. The evaluation team will also evaluate the offeror's capability to complete the schedule within the proposed contract duration and the realism of the schedule. Schedules offering a duration less than that shown in Section 00800, Paragraph 1.3 may receive a higher score if the schedule is shown to be realistic and achievable. The Government reserves the right to accept or reject a betterment proposing a shorter duration. A schedule giving a duration longer than that shown in specification section 00800, paragraph 1.3 will be considered unacceptable. | *1 |
| *1 | C. Sequence of Work. The narrative description must show understanding of the complexity of this project. A review will be made considering reasonableness to proposed completion schedule.   | *1 |

*1	e. Subcontracting Plan.	*1
*1	The proposed <b>Subcontracting Plan for Large Business</b> will be <b>assessed</b> for acceptability in accordance with AFARS 19.705 and it will also be <b>evaluated along with the other evaluation factors</b> . To be acceptable, subcontracting plans must be rated 71 percent or higher under the AFARS evaluation system. Any plan that is rated 70 percent or less under the AFARS evaluation system will be carefully considered for acceptability. Due to requirements for review of the successful Offeror's subcontracting plan by other agencies, the Government reserves the right to negotiate the final plan with the successful Offeror before award. In the <b>evaluation</b> process, higher percent of utilization of small businesses, small disadvantaged business, woman-owned small business, HUBZone small business and service disabled veteran owned small business will be <b>looked on more favorably</b> . (Note: Those Offerors who are a small business, HUB zone small business, small disadvantaged business, and/or woman-owned small business are automatically considered to have met this requirement and will be given full credit for this factor.)	*1
*1		*1
*1		*1
	3.2. Summary. Proposals will be evaluated on their own merit, independently and as objectively as possible. Subjective comparisons will be limited to those areas where it is not feasible to quantify criteria, i.e., aesthetics and certain elements of information concerning past performance. Due to the obvious and unavoidable interrelationships among evaluation criteria; however, final determination of contract award will be based on the best composite offer, all factors considered. The evaluation will be conducted in accordance with the following process:	
	3.2.1. Proposals will be given a quality rating based on those factors discussed above.	
	3.2.2. After the quality ratings of proposals have been determined, proposals will be evaluated against price; however, price is not scored. PRICE will be evaluated for fairness and reasonableness through the use of price analysis. Price analysis will be performed on each proposal. Price will also be checked for unbalancing of line items. Offerors are cautioned to distribute costs appropriately. The evaluation factors other than cost or price, when combined, are approximately equal to cost or price	
	3.2.3. If the Government determines that discussions are necessary, it will establish a competitive range and will conduct discussions with all offerors in the competitive range. At the conclusion of discussions, the Government will request final proposal revisions from all offerors still in the competitive range. Following receipt of the final proposal revision, each received offer would be scored, and an award made to that offeror whose offer, conforming to the solicitation, will be most advantageous to the Government, price and other factors considered. Please note that an award may be made on the basis of initial offers received, without discussion; therefore, the offeror should submit the best offer possible.	
	4. OPENING PROPOSALS AND DISCUSSIONS. No information regarding proposals received will be furnished prior to completion of evaluation, discussion, and award of the contract.	
	5. NOTIFICATION OF NONSELECTION. The Government will notify all offerors not selected, advising them of the proposal which was selected. Unsuccessful offerors are invited to request in writing a debriefing meeting with Louisville District Corps of Engineers staff. The request should be made to the Contracting Officer within three days after receipt of notification of contract award.	



PROJECT TABLE OF CONTENTS

DIVISION 00 - CONTRACT REQUIREMENTS

00010 SOLICITATION/CONTRACT FORM; SUPPLIES OF SERVICES AND PRICES  
00100 BIDDING SCHEDULE/INSTRUCTIONS TO BIDDERS  
00115 PROPOSAL SUBMISSION REQUIREMENTS  
00130 PROPOSAL EVALUATION SYSTEM  
00600 REPRESENTATIONS AND CERTIFICATIONS  
00700 CONTRACT CLAUSES  
00800 SPECIAL CONTRACT REQUIREMENTS  
00800 SPECIAL CONTRACT REQUIREMENTS FORMS (SEPARATE ATTACHMENT)  
SUBMITTAL REGISTERS  
WAGE RATES

DIVISION 01 - GENERAL REQUIREMENTS

01090 SOURCES FOR REFERENCE PUBLICATIONS  
01312 QUALITY CONTROL SYSTEM (QCS)  
01320 PROJECT SCHEDULE  
01335 SUBMITTAL PROCEDURES  
01356 STORM WATER POLLUTION PREVENTION MEASURES  
01410 ENVIRONMENT PROTECTION  
01451 CONTRACTOR QUALITY CONTROL  
01500 TEMPORARY CONSTRUCTION FACILITIES  
01800 SYSTEM OPERATING, MAINTENANCE, AND REPAIR MANUALS

DIVISION 02 - SITE WORK

02090 Removal and Disposal of Lead Containing Painted Materials  
02120 TRANSPORTATION AND DISPOSAL OF HAZARDOUS MATERIALS  
02130 CONTROL OF WATER  
02132 FOLLOWER COFFERDAM  
02170 COFFERDAM  
02210 SUBSURFACE DRILLING, SAMPLING, AND TESTING  
02217 FOUNDATION PREPARATION  
02220 GENERAL DEMOLITION  
02221 COFFERDAM DEMOLITION  
02226 FOUNDATION BLASTING AND EXCAVATION  
02240 SANDSTONE BENCHES AND BOLLARDS  
02261 SOIL-CEMENT-BENTONITE SLURRY TRENCH CUT-OFF  
02270 STONE PROTECTION  
02300 EARTHWORK  
02316 EXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITIES SYSTEMS  
**\*1 02463 NOT USED \*1**  
02464 METAL SHEET PILING  
02466 DRILLED SHAFTS  
02490 PRESTRESSED ANCHORS  
02510 WATER DISTRIBUTION SYSTEM  
02620 SUBDRAINAGE SYSTEM  
02630 STORM-DRAINAGE SYSTEM  
02714 DRAINAGE LAYER  
02721 SUBBASE COURSES  
02741 HOT-MIX ASPHALT (HMA) FOR ROADS  
02748 BITUMINOUS TACK AND PRIME COATS

02762 COMPRESSION JOINT SEALS FOR CONCRETE PAVEMENTS  
02763 PAVEMENT MARKINGS  
02820 VINYL COATED CHAIN LINK FENCING  
02821 FENCING  
02822 ORNAMENTAL PICKET FENCES AND GATES

\*1 02840 NOT USED

\*1

02850 GUARDRAIL SYSTEMS  
02921 SEEDING  
02922 SODDING

DIVISION 03 - CONCRETE

03101 FORMWORK FOR CONCRETE  
03151 EXPANSION, CONTRACTION AND CONSTRUCTION JOINTS IN CONCRETE  
FOR CIVIL WORKS  
03201 STEEL BARS AND WELDED WIRE FABRIC FOR CONCRETE REINFORCEMENT  
FOR CIVIL WORKS  
03230 STEEL STRESSING STRANDS AND ACCESSORIES FOR PRESTRESSED  
CONCRETE  
03300 GENERAL CONCRETE REQUIREMENTS  
03301 CAST-IN-PLACE STRUCTURAL CONCRETE  
03330 CAST-IN-PLACE ARCHITECTURAL CONCRETE  
03415 PRECAST CONCRETE  
03700 MASS CONCRETE  
03701 ROLLER COMPACTED CONCRETE

DIVISION 04 - MASONRY

04220 GLASS BLOCK UNITS  
04465 GRANITE OBELISK

DIVISION 05 - METALS

05055 METALWORK FABRICATION, MACHINE WORK, MISCELLANEOUS  
PROVISIONS  
05090 WELDING, STRUCTURAL  
05091 ULTRASONIC INSPECTION OF WELDMENTS  
05093 WELDING PRESSURE PIPING  
05120 STRUCTURAL STEEL  
05300 STEEL DECKING  
05400 COLD-FORMED STEEL FRAMING  
05500 MISCELLANEOUS METAL  
05502 METALS: MISCELLANEOUS, STANDARD ARTICLES, SHOP FABRICATED  
ITEMS

DIVISION 06 - WOODS & PLASTICS

06100 ROUGH CARPENTRY  
06410 CUSTOM CASEWORK

DIVISION 07 - THERMAL & MOISTURE PROTECTION

07412 NON-STRUCTURAL METAL ROOFING  
07416 STRUCTURAL STANDING SEAM METAL ROOF (SSSMR) SYSTEM  
07551 MODIFIED BITUMEN ROOFING  
07600 SHEET METALWORK, GENERAL

07840 FIRESTOPPING  
07900 JOINT SEALING

DIVISION 08 - DOORS & WINDOWS

08110 STEEL DOORS AND FRAMES  
08210 WOOD DOORS  
08316 WATERTIGHT DOORS AND FRAMES  
08520 ALUMINUM WINDOWS  
08700 BUILDERS' HARDWARE  
08810 GLASS AND GLAZING

DIVISION 09 - FINISHES

09250 GYPSUM WALLBOARD  
09310 CERAMIC TILE  
09510 ACOUSTICAL AND LINEAR ALUMINUM CEILINGS  
09690 CARPET TILE  
09900 PAINTING AND CHEMICALLY STAINED CONCRETE  
09965 PAINTING: HYDRAULIC STRUCTURES

DIVISION 10 - SPECIALTIES

10200 FIXED METAL LOUVERS  
10270 RAISED FLOOR SYSTEM  
10300 EXTERIOR SUN CONTROL DEVICES  
10430 EXTERIOR SIGNAGE  
10440 INTERIOR SIGNAGE  
10508 METAL LOCKERS AND BENCH SEATS  
10520 FIRE EXTINGUISHER CABINETS  
10800 TOILET ACCESSORIES

DIVISION 11 - EQUIPMENT

11150 CANTILEVER SLIDE GATE OPERATOR SYSTEM  
11175 ELASTOMERIC BEARING PADS  
11211 PUMPS: WATER, CENTRIFUGAL  
11285 MITER GATES  
11287 CULVERT VALVES, BULKHEADS, AND BY-PASS PIPING AND VALVES  
11290 FLOATING MOORING BITTS  
11310 PUMPS; RAW WATER, UTILITY AND SUMP  
11311 SEWAGE GRINDER PUMP STATION

DIVISION 13 - SPECIAL CONSTRUCTION

13080 SEISMIC PROTECTION FOR MISCELLANEOUS EQUIPMENT  
13100 LIGHTNING PROTECTION SYSTEM  
13110 CATHODIC PROTECTION SYSTEM (SACRIFICIAL ANODE)  
13202 FUEL STORAGE SYSTEMS  
13500 INSTRUMENTATION PROGRAM  
13501 MOVEMENT PINS  
13502 INCLINOMETERS  
13503 PIEZOMETERS  
13504 VIBRATING WIRE STRAIN GAUGES/ THERMISTORS  
13505 PRESSURE CELLS  
13527 AUTOMATED DATA ACQUISITION SYSTEM

13532 LOAD CELLS MOUNTED ON PRESTRESSED ANCHORS  
13850 FIRE DETECTION AND ALARM SYSTEM, DIRECT CURRENT LOOP

DIVISION 15 - MECHANICAL

15010 HYDRAULIC POWER SYSTEMS FOR CIVIL WORKS STRUCTURES  
15070 SEISMIC PROTECTION FOR MECHANICAL EQUIPMENT  
15080 THERMAL INSULATION FOR MECHANICAL SYSTEMS  
15400 PLUMBING, PRESSURE PIPING, AND OTHER MECHANICAL SYSTEMS  
15653 AIR-CONDITIONING SYSTEM (UNITARY TYPE)  
15895 AIR SUPPLY, DISTRIBUTION, VENTILATION, AND EXHAUST SYSTEM  
15950 HEATING, VENTILATING AND AIR CONDITIONING (HVAC) CONTROL  
SYSTEMS  
15990 TESTING, ADJUSTING, AND BALANCING OF HVAC SYSTEMS  
15995 COMMISSIONING OF HVAC SYSTEMS

DIVISION 16 - ELECTRICAL

16070 SEISMIC PROTECTION FOR ELECTRICAL EQUIPMENT  
16120 INSULATED WIRE AND CABLE  
16263 DIESEL-GENERATOR SET STATIONARY, WITH AUXILIARIES  
16375 ELECTRICAL DISTRIBUTION SYSTEM, UNDERGROUND  
16410 AUTOMATIC TRANSFER AND BY-PASS/ISOLATION SWITCHES  
16415 ELECTRICAL WORK, INTERIOR  
16528 EXTERIOR LIGHTING  
16751 CLOSED CIRCUIT TELEVISION SYSTEMS  
16768 FIBER OPTIC DATA TRANSMISSION SYSTEM  
16770 RADIO AND PUBLIC ADDRESS SYSTEMS  
16800 AUDIO SYSTEM  
16900 CONTROL AND INSTRUMENTATION  
16910 PROGRAMMABLE LOGIC CONTROLLER  
16920 PERSONAL COMPUTERS AND NETWORKS

-- End of Project Table of Contents --

DOCUMENT TABLE OF CONTENTS

DIVISION 00 - DOCUMENTS

SECTION 00800

SPECIAL CONTRACT REQUIREMENTS

03/01

PART 1 GENERAL

- 1.1 NOT USED (REFERENCES)
- 1.2 SUBMITTALS
- 1.3 COMMENCEMENT, PROSECUTION AND COMPLETION OF WORK (APR 1984) FAR 52.211-10.
- 1.4 LIQUIDATED DAMAGES--CONSTRUCTION (SEP 2000) FAR 52.211-12.
- 1.5 TIME EXTENSIONS (SEPT 2000) FAR 52.211-13
- 1.6 NOT USED (EXCLUSION OF PERIODS IN COMPUTING COMPLETION SCHEDULES)
- 1.7 CONTRACT DRAWINGS AND SPECIFICATIONS
- 1.8 AS-BUILT DOCUMENTS
  - 1.8.1 General.
    - 1.8.1.1 As-Built Drawings
    - 1.8.1.2 As-Built Specifications
  - 1.8.2 Maintenance of Working As-Built Drawings and Specifications
  - 1.8.3 Retainage
  - 1.8.4 Preliminary Submittal
  - 1.8.5 Preparation of Final As-Built Drawings and Specifications
  - 1.8.6 Markings and Indicators
  - 1.8.7 Preparation of Final As-Built Specifications
  - 1.8.8 Preparation of Other As-Built Documents
  - 1.8.9 Submittal of Final As-Built Documents
  - 1.8.10 Partial Occupancy
  - 1.8.11 Computer Aided Design and Drafting (CADD) Drawings
  - 1.8.12 Payment
- 1.9 NOT USED (AS-BUILT DOCUMENTS FOR DESIGN BUILD PROJECTS)
- 1.10 EQUIPMENT DATA
- 1.11 PHYSICAL DATA (APR 1984) FAR 52.236-4.
- 1.12 UTILITIES (APR 1984) FAR 52.236-14
- 1.13 QUANTITY SURVEYS (APR 1984) FAR 52.236-16
- 1.14 LAYOUT OF WORK (APR 1984) FAR 52.236-17
- 1.15 NOT USED (LINES, GRADES AND LIMITS)
- 1.16 PERFORMANCE OF WORK BY THE CONTRACTOR (APR 1984) FAR 52.236-1
- 1.17 SUPERINTENDENCE OF SUBCONTRACTORS
- 1.18 IDENTIFICATION OF EMPLOYEES
- 1.19 NOT USED (CONTRACTOR-PREPARED NETWORK ANALYSIS SYSTEM )
- 1.20 WARRANTY OF CONSTRUCTION (MAR 1984) ALTERNATE 1 (APR 1984) FAR 52.246-21I
- 1.21 PAYMENT FOR MOBILIZATION AND PREPARATORY WORK (JAN 1997) DFARS 252.236-7003
- 1.22 NOT USED (PAYMENT FOR MOBILIZATION AND DEMOBILIZATION (DEC 1991)

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

DFARS 252.236-7004.)

- 1.23 SALVAGE MATERIALS AND EQUIPMENT.
- 1.24 IDENTIFICATION OF GOVERNMENT-FURNISHED PROPERTY (APR 1984) FAR 52.245-3.
- 1.25 NOT USED (AGGREGATE SOURCES)
- 1.26 PROJECT SIGN
- 1.27 NOT USED (CONTRACTOR QUALITY CONTROL)
- 1.28 WAGE RATES
- 1.29 PURCHASE ORDERS
- 1.30 INTERFERENCE WITH TRAFFIC AND PUBLIC AND PRIVATE PROPERTY.
- 1.31 SEQUENCE OF WORK.
- 1.32 GOVERNMENT FIELD OFFICE FACILITIES AND SERVICES.
- 1.33 NOT USED (COMPLIANCE WITH POST/BASE REGULATIONS)
- 1.34 EQUIPMENT AND OWNERSHIP AND OPERATING EXPENSE SCHEDULE (MAR 1995) EFAR 52.231-5000.
- 1.35 LABOR, EQUIPMENT, AND MATERIAL REPORTS
- 1.36 NOT USED (ILLINOIS RETAILER'S OCCUPATIONAL TAX AND USE TAX)
- 1.37 NOT USED (INDIANA SALES AND USE TAX)
- 1.38 NOT USED (OHIO SALES AND USE TAX)
- 1.39 PROGRESS PHOTOGRAPHS
- 1.40 PAYMENT FOR MATERIALS DELIVERED OFFSITE. (MAR 1995) EFARS 52.232-5000
- 1.41 INSURANCE--WORK ON A GOVERNMENT INSTALLATION (SEP 1989) FAR 52.228-5.
- 1.42 IMPLEMENTATION OF GOVERNMENT RESIDENT MANAGEMENT SYSTEM
- 1.43 TIME EXTENSIONS FOR UNUSUALLY SEVERE WEATHER. ER 415-1-15
- 1.44 USE OF INCLINOMETER FOR LONG BED DUMP TRUCKS
- 1.45 AVAILABILITY OF SAFETY AND HEALTH REQUIREMENTS MANUAL (EM 385-1-1)
- 1.46 NOT USED (FIRE PROTECTION DURING CONSTRUCTION)
- 1.47 HAUL ROADS
- 1.48 NOT USED (RADIOACTIVE MATERIAL/EQUIPMENT)
- 1.49 NOT USED(CONSTRUCTION/SITE MANAGEMENT STANDARDS FOR CONSTRUCTION ON AMC INSTALLATIONS)
- 1.50 CONSTRUCTION HAZARD COMMUNICATION
- 1.51 NOT USED(ENVIRONMENTAL PROTECTION CLAUSE TANK CLEANING AND PAINTING)
- 1.52 MECHANICAL ROOM LAYOUT (ORL)
- 1.53 RIGHTS IN TECHNICAL DATA--NONCOMMERCIAL ITEMS
- 1.54 LIMITATIONS ON THE USE OR DISCLOSURE OF GOVERNMENT-FURNISHED INFORMATION MARKED WITH RESTRICTIVE LEGEND DFARS
- 1.55 NOT USED (FIRMR APPLICABILITY)
- 1.56 VARIATIONS IN ESTIMATED QUANTITIES - SUBDIVIDED ITEMS
- 1.57 PARTNERING
- 1.58 NOT USED
- 1.59 NOT USED (CONSTRUCTION AND DEMOLITION (C&D) WASTE MANAGEMENT PLAN)
- 1.60 DAMAGE TO WORK (ORL)
- 1.61 CONTINUING CONTRACTS (MAR 1995) EFARS 52.232-5001.
- 1.62 OBSTRUCTION OF NAVIGABLE WATERWAYS (DEC 1991) DFARS 252.236-7002.
- 1.63 SIGNAL LIGHTS
- 1.64 NOT USED (LAKE OPERATION)
- 1.65 NOT USED (PROPOSED BETTERMENTS)
- 1.66 NOT USED (SEQUENCE OF DESIGN/CONSTRUCTION)
- 1.67 NOT USED (SEQUENCE OF DESIGN/CONSTRUCTION)
- 1.68 NOT USED (DESIGN RESPONSIBILITY OF THE DESIGN/BUILD CONTRACTOR)

McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

- 1.69 NOT USED (KEY PERSONNEL, SUBCONTRACTORS AND OUTSIDE ASSOCIATES OR CONSULTANTS)
- 1.70 NOT USED (REQUIREMENTS FOR REGISTRATION OF DESIGNERS)
- 1.71 NOT USED (DESIGN/BUILD CONTRACT - ORDER OF PRECEDENCE)
- 1.72 NOT USED (DESIGN CONFERENCES)
- 1.73 POLLUTION PREVENTION PLAN
- 1.74 WORK COORDINATION
- 1.75 INDEFINITE QUANTITIES
- 1.76 SAFETY ENGINEER REQUIREMENT
- 1.77 SAFETY INCENTIVE CLAUSE
- 1.78 COFFERDAM EVACUATION REQUIREMENTS
- 1.79 LIGHTNING DETECTION SYSTEM
- 1.80 PUBLIC MEETINGS
- 1.81 ADDITIONAL SAFETY REQUIREMENTS
- 1.82 INSPECTION FACILITIES
- 1.83 PRESERVATION AND RECOVERY OF HISTORICAL, ARCHAEOLOGICAL, AND CULTURAL RESOURCES
- 1.84 SCHEDULED PRE-PROPOSAL SITE VISIT MEETING

-- End of Document Table of Contents --

SECTION 00800

SPECIAL CONTRACT REQUIREMENTS

03/01

PART 1 GENERAL

1.1 NOT USED (REFERENCES)

1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals not having a "GA" designation are for information only. When used, a designation following the "GA" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01335 SUBMITTAL PROCEDURES:

SD-01 Data

Equipment-in-Place List; FIO

The Contractor shall be required to make a list of all installed equipment furnished under this contract.

Maintenance and Parts Data; FIO

The Contractor will be required to furnish a brochure, catalog cut, parts list, manufacturer's data sheet or other publication which will show detailed parts data.

Request to Interrupt Utilities; GA,RE

Request for permission to shut down utility service shall be submitted in writing not less than 72 hours prior to date of proposed interruption.

SF 1413, "Statement and Acknowledgement"; FIO

Within 7 days after the award of any subcontract, the Contractor shall deliver to the Contracting Officer a completed SF 1413.

Equipment Warranty Identification Tags; GA,RE

Sample tags representative of how the Contractor will complete other tags.

System of Property Control; GA,RE

Plan for the control of all salvage material and equipment



Purchase Orders; FIO

Five copies of all purchase orders.

Progress Photographs; FIO

Identification of Technical Data; FIO

Traffic Control Plan; GA,RE

Before starting construction of the road and bridge, a Traffic Control Plan shall be developed by the Contractor and approved by the Contracting Officer.

Plan for Maintaining Navigation; GA,RE

Cofferdam Evacuation Plan; GA,RE

Personnel Stairs and Ladders; GA,RE

The Contractor's plan for maintaining the cofferdam exitways during interference of construction activities, including drawings and supporting calculations for any stairway modifications.

#### SD-04 Drawings

As-Built Documents; GA,RE.

Drawings and specifications showing final as-built conditions of the project. The CADD

drawing submittals shall consist of two (2) separate types of media. One set of media shall consist of the electronic CADD drawing files. The second media type, shall consist of one set of mylars, 2 sets of blue line prints of the mylars, and the approved marked working as-built prints.

Mechanical Room Layout; GA,ED.

#### SD-08 Statements

Contractor CADD Technician Qualifications; GA,RE

The Contractor will be required to provide a statement of qualifications of the CADD Operator(s) responsible for completion of the As-built drawings.

#### SD-09 Reports

Small Tool Usage Plan; GA,RE

The Contractor's plan for use of small tools shall be submitted for determination of estimated consumption.

Labor, Equipment and Material Reports; FIO.

## SD-13 Certificates

Warranties; FIO

Insurance; FIO

1.3 COMMENCEMENT, PROSECUTION AND COMPLETION OF WORK (APR 1984) FAR  
52.211-10.  
2 Jan 96

A "First Notice to Proceed" will be issued under which only administrative work will be initiated. Because the previous Cofferdam contract activity at the job site will not be complete and is likely to conflict with this Lock Contract, no physical Lock Contract work will be performed at the job site until about the time of 1 January 2003. The Lock contractor should not expect to be allowed to conduct any site work until after said date and a "Second Notice to Proceed" is issued.

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**Should the "Second Notice to Proceed" not be issued until a later time, circumstances for the delay will be evaluated and any adjustment required will be executed in accordance with the Changes clause.** A Default Clause time extension may be granted as appropriate.

\*1

When all submissions, plans and prerequisites for site work have been satisfied and a "Second Notice to Proceed" is issued, the physical site work shall be conducted by the Lock Contractor. The contractor shall be required to proceed with physical work, including operation and maintenance of the cofferdam dewatering system, within 10 calendar days of receipt of the "Second Notice to Proceed", prosecute said work diligently, and complete the entire work ready for use not later than 1,521 calendar days after date of receipt of the "Second Notice to Proceed." The time stated for completion shall include as-built drawings, O&M manuals, operational tests/reports/training/instructions, equipment lists, and final cleanup of the premises. The time for all contract schedule, progress and liquidated damage determinations will be based on the date of the "Second Notice to Proceed."

1.4 LIQUIDATED DAMAGES--CONSTRUCTION (SEP 2000) FAR 52.211-12.  
Oct 00

a. If the Contractor fails to complete the work within the time specified in the contract, the Contractor shall pay liquidated damages to the Government in the amount of \$7,200.00 for each calendar day of delay until the work is completed or accepted.

b. If the Government terminates the Contractor's right to proceed, liquidated damages will continue to accrue until the work is completed. These liquidated damages are in addition to excess costs of repurchase under the Termination clause.

1.5 TIME EXTENSIONS (SEPT 2000) FAR 52.211-13  
Oct 00

Time extensions for contract changes will depend upon the extent, if any, by which the changes cause delay in the completion of the various elements of construction. The change order granting the time extension may provide that the contract completion date will be extended only for those specific elements related to the changed work and that the remaining contract completion dates for all other portions of the work will not be altered. The change order also may provide for an equitable readjustment of liquidated damages under the new completion schedule.

1.6 NOT USED (EXCLUSION OF PERIODS IN COMPUTING COMPLETION SCHEDULES)

1.7 CONTRACT DRAWINGS AND SPECIFICATIONS (AUG 2000) DFARS 252.236-7001  
19 Sept 2000

(Sept 2000)

a. At award, the Government will furnish the Contractor a compact disk containing all technical contract documents. This disk will include a complete set of drawing files and technical specification files which have all amendments incorporated. The disk will contain drawing files in CALS Type 4 format and technical specifications in PDF format.

The CALS files and the PDF files are being provided for the Contractor's use in printing hard copies of contract documents.

In addition, native CADD files and Specsintact files are provided in accordance with "AS-BUILTS DOCUMENTS" paragraph for the Contractor's use in developing as-built plans and specifications.

b. The Contractor shall--

- (1) Check all drawings furnished immediately upon receipt;
- (2) Compare all drawings and verify the figures before laying out the work;
- (3) Promptly notify the Contracting Officer of any discrepancies; and
- (4) Be responsible for any errors which might have been avoided by complying with paragraph b.(1), b.(2), and b.(3); and
- (5) Reproduce and print contract drawings and specifications as needed.

c. Omissions from the drawings or specifications or the misdescription of details of work which are manifestly necessary to carry out the intent of the drawings and specifications, or which are customarily performed, shall not relieve the Contractor from performing such omitted or misdescribed details of the work. The Contractor shall perform such details as if fully and correctly set forth and described in the drawings

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

and specifications.

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d. The work shall conform to the specifications and the contract drawings identified on the following index of drawings.

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## TABLE OF DRAWINGS

VOLUME 1 GENERAL INFORMATION, DEMOLITION,  
SITE INFORMATION, LOCK AND FILLING & EMPTYING SYSTEM

DWG CODE	SH. REF. NO.	TITLE
GENERAL		
MCA100.1	X-0	COVER SHEET VOLUME 1
MCA100.1	X-1	INDEX SHEET 1
MCA100.1	X-2	INDEX SHEET 2
MCA100.1	X-3	INDEX SHEET 3
MCA100.1	X-4	INDEX SHEET 4
MCA100.1	X-4A	INDEX SHEET 5
MCA100.1	X-4B	INDEX SHEET 6
MCA100.1	X-4C	INDEX SHEET 7
MCA100.1	X-4D	INDEX SHEET 8
MCA100.1	X-5	PICTORIAL VIEW OF PROJECT
MCA100.1	X-6	LOCATION PLAN AND VICINITY MAP
MCA100.1	X-7	GENERAL PLAN
MCA100.1	X-7A	PLAN-EXPECTED CONSTRUCTION CONDITIONS
MCA100.1	X-8	SURVEY CONTROL
MCA100.1	X-9	REQUIRED BRIDGE CONSTRUCTION SEQUENCE
MCA100.1	X-10	NOT USED
MCA100.1	X-11	NOT USED
MCA100.1	X-12	NOT USED
MCA100.1	X-13	NOT USED
MCA100.1	X-14	NOT USED
FOUNDATION		
MCA105.1	F-1	PLAN TOP OF ROCK
MCA105.1	F-2	OVERALL PLAN OF PROFILES AND SECTIONS
MCA105.1	F-3	CROSS SECTION STATION 15+00
MCA105.1	F-4	CROSS SECTION STATION 17+00
MCA105.1	F-5	CROSS SECTION STATION 18+25
MCA105.1	F-6	CROSS SECTION STATION 20+00
MCA105.1	F-7	CROSS SECTION STATION 21+50
MCA105.1	F-8	CROSS SECTION STATION 23+00
MCA105.1	F-9	CROSS SECTION STATION 25+00
MCA105.1	F-10	CROSS SECTION STATION 26+70
MCA105.1	F-11	CROSS SECTION STATION 30+00
MCA105.1	F-12	CROSS SECTION STATION 31+50
MCA105.1	F-13	CROSS SECTION STATION 32+70
MCA105.1	F-14	CROSS SECTION STATION 33+50
MCA105.1	F-15	NORTH LOCK WALL ROCK PROFILE (SHEET 1 OF 2)

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

MCA105.1	F-16	NORTH LOCK WALL ROCK PROFILE (SHEET 2 OF 2)
MCA105.1	F-17	SOUTH LOCK WALL ROCK PROFILE (SHEET 1 OF 2)
MCA105.1	F-18	SOUTH LOCK WALL ROCK PROFILE (SHEET 2 OF 2)
MCA105.1	F-19	FOUNDATION EXCAVATION PLAN (SHEET 1 OF 3)
MCA105.1	F-20	FOUNDATION EXCAVATION PLAN (SHEET 2 OF 3)
MCA105.1	F-21	FOUNDATION EXCAVATION PLAN (SHEET 3 OF 3)
MCA105.1	F-22	EXCAVATION METHOD PLAN (SHEET 1 OF 3)
MCA105.1	F-23	EXCAVATION METHOD PLAN (SHEET 2 OF 3)
MCA105.1	F-24	EXCAVATION METHOD PLAN (SHEET 3 OF 3)

## DEMOLITION

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MCA110.1	C-1	COFFERDAM DEMOLITION PLAN SHEET 1 OF 2
MCA110.1	C-2	COFFERDAM DEMOLITION PLAN SHEET 2 OF 2
MCA110.1	C-2A	<b>NOSE PIER DEMOLITION DETAILS</b>
MCA110.1	C-2B	<b>BASCULE BRIDGE DEMOLITION DETAILS</b>
MCA110.1	C-2C	<b>SWING BRIDGE DEMOLITION DETAILS</b>
MCA110.1	C-2D	NOSE PIER RESTORATION DETAILS
MCA120.1	C-3	DISPOSAL AREA AND OVERALL LOCATION PLAN
MCA120.1	C-4	U.S. GOVERNMENT PROPERTY LINE (SHEET 1 of 3)
MCA120.1	C-5	U.S. GOVERNMENT PROPERTY LINE (SHEET 2 of 3)
MCA120.1	C-6	U.S. GOVERNMENT PROPERTY LINE (SHEET 3 of 3)
MCA120.1	C-7	STORAGE AREA ONE
MCA120.1	C-8	STORAGE AREA TWO
MCA120.1	C-9	DISPOSAL AREA AND STORAGE AREA THREE
MCA120.1	C-10	OVERALL DEMOLITION PLAN
MCA120.1	C-11	DEMOLITION PLAN (SHEET 1 of 4)
MCA120.1	C-12	DEMOLITION PLAN (SHEET 2 of 4)
MCA120.1	C-12A	ENLARGED DEMOLITION PLAN
MCA120.1	C-12B	LOCK DEMOLITION PHOTOGRAPHS
MCA120.1	C-13	DEMOLITION PLAN (SHEET 3 of 4)
MCA120.1	C-14	DEMOLITION PLAN (SHEET 4 of 4)
MCA120.1	C-14A	DEMILITION WALL TREATMENT
MCA120.1	C-14B	NOT USED

**SITE INFORMATION AND ACCESS ROADS****\*1**

## SITE CIVIL

MCA160.1	C-15	OVERALL SITE PLAN
MCA160.1	C-16	SITE PLAN (SHEET 1 of 4)
MCA160.1	C-17	SITE PLAN (SHEET 2 of 4)
MCA160.1	C-17A	SITE PLAN (SHEET 3 of 4)
MCA160.1	C-17B	SITE PLAN (SHEET 4 of 4)
MCA160.1	C-18	ESPLANADE SITE PLAN (SHEET 1 of 3)
MCA160.1	C-19	ESPLANADE SITE PLAN (SHEET 2 of 3)
MCA160.1	C-20	ESPLANADE SITE PLAN (SHEET 3 of 3)
MCA160.1	C-21	OVERALL GRADING AND DRAINAGE PLAN
MCA160.1	C-22	GRADING PLAN (SHEET 1 of 2)
MCA160.1	C-23	GRADING PLAN (SHEET 2 of 2)
MCA160.1	C-24	ESPLANADE GRADING PLAN (SHEET 1 of 3)
MCA160.1	C-25	ESPLANADE GRADING PLAN (SHEET 2 of 3)
MCA160.1	C-26	ESPLANADE GRADING PLAN (SHEET 3 of 3)
MCA160.1	C-27	NEW FENCING - DEMOLITION AND SITE PLAN
MCA160.1	C-28	DISPOSAL AREA GRADING PLAN

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

MCA160.1	C-29	OVERALL EROSION CONTROL PLAN
MCA160.1	C-30	EROSION CONTROL PLAN (SHEET 1 of 4)
MCA160.1	C-31	EROSION CONTROL PLAN (SHEET 2 of 4)
MCA160.1	C-32	EROSION CONTROL PLAN (SHEET 3 of 4)
MCA160.1	C-33	EROSION CONTROL PLAN (SHEET 4 of 4)
MCA160.1	C-34	EROSION CONTROL DETAILS
MCA160.1	C-35	MAINTENANCE ACCESS ROADS PROFILES
MCA160.1	C-36	STORM DRAIN PROFILES
MCA160.1	C-37	STORM DRAIN DETAILS
MCA160.1	C-38	MAINTENANCE ACCESS ROAD A CROSS SECTIONS (SHEET 1 of 4)
MCA160.1	C-39	MAINTENANCE ACCESS ROAD A CROSS SECTIONS (SHEET 2 of 4)
MCA160.1	C-40	MAINTENANCE ACCESS ROAD A CROSS SECTIONS (SHEET 3 of 4)
MCA160.1	C-41	MAINTENANCE ACCESS ROAD A CROSS SECTIONS (SHEET 4 of 4)
MCA160.1	C-41A	MAINTENANCE ACCESS ROAD B CROSS SECTIONS
MCA160.1	C-41B	MAINTENANCE ACCESS ROAD C CROSS SECTIONS (SHEET 1 of 3)
MCA160.1	C-41C	MAINTENANCE ACCESS ROAD C CROSS SECTIONS (SHEET 2 of 3)
MCA160.1	C-41D	MAINTENANCE ACCESS ROAD C CROSS SECTIONS (SHEET 3 of 3)
MCA160.1	C-41E	DISPOSAL AREA ROAD CROSS SECTIONS (SHEET 1 of 4)
MCA160.1	C-41F	DISPOSAL AREA ROAD CROSS SECTIONS (SHEET 2 of 4)
MCA160.1	C-41G	DISPOSAL AREA ROAD CROSS SECTIONS (SHEET 3 of 4)
MCA160.1	C-41H	DISPOSAL AREA ROAD CROSS SECTIONS (SHEET 4 of 4)
MCA160.1	C-41I	NOT USED
MCA160.1	C-42	TYPICAL SECTIONS AND DETAILS (SHEET 1 of 2)
MCA160.1	C-43	TYPICAL SECTIONS AND DETAILS (SHEET 2 of 2)
MCA160.1	C-44	FENCE DETAILS
MCA160.1	C-44A	GATE DETAILS
MCA160.1	C-44B	WATER DISTRIBUTION PLAN (SHEET 1 OF 2)
MCA160.1	C-44C	WATER DISTRIBUTION PLAN (SHEET 2 OF 2)
MCA160.1	C-44D	WATER DISTRIBUTION DETAILS

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**ACCESS ROADS**

MCA160.1	C-45	NOT USED
MCA160.1	C-46	OVERALL ACCESS ROAD PLAN
MCA160.1	C-47	PLAN SHEET-1
MCA160.1	C-48	PLAN SHEET-2
MCA160.1	C-49	PLAN SHEET-3
MCA160.1	C-50	PLAN SHEET-4
MCA160.1	C-51	PLAN SHEET-5
MCA160.1	C-52	TYPICAL SECTIONS
MCA160.1	C-53	TYPICAL SECTIONS
MCA160.1	C-54	27th STREET PROFILE STA. 6+50 TO STA. 24+00
MCA160.1	C-55	27th STREET PROFILE STA. 24+00 TO STA. 34+00
MCA160.1	C-56	MARINE & 27TH STREET PROFILES
MCA160.1	C-57	McALPINE LOCK ROAD PROFILE
MCA160.1	C-58	27th STREET CROSS SECTIONS
MCA160.1	C-59	27th STREET CROSS SECTIONS
MCA160.1	C-60	MARINE STREET CROSS SECTIONS

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

MCA160.1	C-61	MARINE STREET CROSS SECTIONS
MCA160.1	C-62	McALPINE LOCK ROAD CROSS SECTIONS
MCA160.1	C-63	McALPINE LOCK ROAD CROSS SECTIONS
MCA160.1	C-64	INTERSECTION DETAILS
MCA160.1	C-65	INTERSECTION DETAILS
MCA160.1	C-66	INTERSECTION DETAILS
MCA160.1	C-67	NOT USED
MCA160.1	C-68	NOT USED
MCA160.1	C-69	NOT USED
MCA160.1	C-70	NOT USED
MCA160.1	C-71	NOT USED
MCA160.1	C-72	TRAFFIC CONTROL
MCA160.1	C-73	TRAFFIC CONTROL
MCA160.1	C-74	TRAFFIC CONTROL
MCA160.1	C-75	TRAFFIC CONTROL
MCA160.1	C-76	TRAFFIC CONTROL
MCA160.1	C-77	<b>SECURITY GATE DETAILS</b>
MCA160.1	C-78	NOT USED
MCA160.1	C-79	NOT USED
MCA160.1	C-80	NOT USED
MCA160.1	C-81	NOT USED

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## BRIDGE &amp; ROAD ELECTRICAL

MCA160.1	E-1	LIGHTING PLANS SHEET 1
MCA160.1	E-2	LIGHTING PLANS SHEET 2
MCA160.1	E-3	LIGHTING PLANS SHEET 3
MCA160.1	E-4	LIGHTING PLANS SHEET 4
MCA160.1	E-5	LIGHTING PLANS SHEET 5
MCA160.1	E-6	LIGHTING PLANS SHEET 6
MCA160.1	E-7	LIGHTING FIXTURES
MCA160.1	E-8	UTILITY POLE DETAILS
MCA160.1	E-8A	FOUNDATION AND TRENCH DETAILS
MCA160.1	E-8B	POLE WIRING 1
MCA160.1	E-8C	PULL BOX DETAILS 1
MCA160.1	E-8D	ELECTRICAL DETAILS 1
MCA160.2	E-8E	STRUCTURE CONDUIT DETAILS 1
MCA160.3	E-8F	ELECTRICAL DETAILS 2

## SITE STRUCTURAL

MCA160.1	S-1	RETAINING & CUTOFF WALLS - PLAN, SECTION & ELEVATIONS
MCA160.1	S-1A	CUTOFF WALLS - PLAN, SECTIONS & ELEVATIONS
MCA160.1	S-1B	CUTOFF WALLS - PLAN, SECTIONS & ELEVATION
MCA160.1	S-2	RETAINING WALL - CONCRETE & REINFORCEMENT DETAILS
MCA160.1	S-3	NOT USED
MCA160.1	S-4	DRAINAGE CULVERT - PLAN & ELEVATIONS
MCA160.1	S-5	NOT USED
MCA160.1	S-6	DRAINAGE CULVERT - PRECAST CULVERT DETAILS
MCA160.1	S-7	WINGWALL DETAILS
MCA160.1	S-8	TRASHRACK & DETAILS

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## SITE ELECTRICAL

MCA160.1	E-9	ELECTRICAL SITE PLAN (SHEET 1 OF 2)
MCA160.1	E-10	ELECTRICAL SITE PLAN (SHEET 2 OF 2)

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

MCA160.1	E-11	ELECTRICAL SITE DETAILS
MCA160.1	E-12	ELECTRICAL DEMOLITION
MCA160.1	E-13	ELECTRICAL DEMOLITION
MCA160.1	E-13A	ELECTRICAL DEMOLITION
MCA160.1	E-13B	ELECTRICAL DEMOLITION
MCA160.1	E-13C	<b>ELECTRICAL DEMOLITION &amp; MISCELLANEOUS PLANS</b>
MCA160.1	E-14	<b>TRANSFORMER VAULT DETAILS</b>
MCA160.1	E-14A	<b>GATE CONTROL SYSTEM</b>

## LOCK

MCA200.1	S-9	PLAN - LOCK MONOLITHS, SILLS AND DIFFUSERS
MCA200.1	S-9A	ENLARGED PLAN-LOCK MONOLITHS, SILLS AND DIFFUSERS
MCA200.1	S-9B	ENLARGED PLAN-LOCK MONOLITHS, SILLS AND DIFFUSERS
MCA200.1	S-10	ELEVATION NORTH WALL
MCA200.1	S-11	ELEVATION SOUTH WALL
MCA200.1	S-12	GENERAL NOTES & REINFORCEMENT DETAILS
MCA200.1	S-13	GENERAL NOTES & REINFORCEMENT DETAILS
MCA200.1	S-14	<b>TYPICAL MASS CONCRETE JOINT DETAILS</b>
MCA200.1	S-14A	600' LOCK EXPANSION JOINT DETAILS
MCA200.1	S-15	<b>WATERSTOP DETAILS FOR MASS CONCRETE MONOLITHS</b>
MCA200.1	S-15A	NORTH WALL WATERSTOP DETAILS
MCA200.1	S-15B	SOUTH WALL WATERSTOP DETAILS

**MASS CONCRETE MONOLITHS**

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## MONOLITH SM-1

MCA200.1	S-16	PLAN AND ELEVATIONS
MCA200.1	S-17	NOT USED
MCA200.1	S-18	NOT USED
MCA200.1	S-19	REINFORCING PLAN & ELEVATIONS
MCA200.1	S-20	NOT USED
MCA200.1	S-21	NOT USED

## MONOLITH SM-2

MCA200.1	S-22	PLAN AND ELEVATIONS
MCA200.1	S-23	NOT USED
MCA200.1	S-24	NOT USED
MCA200.1	S-25	REINFORCING PLAN & ELEVATIONS
MCA200.1	S-26	NOT USED
MCA200.1	S-27	NOT USED

## MONOLITH SM-3

MCA200.1	S-28	PLAN AND ELEVATIONS
MCA200.1	S-29	SECTIONAL ELEVATIONS
MCA200.1	S-30	MISCELLANEOUS DETAILS
MCA200.1	S-31	REINFORCING PLAN & ELEVATIONS
MCA200.1	S-32	REINFORCING DETAILS
MCA200.1	S-33	NOT USED

## MONOLITH SM-4

MCA200.1	S-34	PLAN AND ELEVATIONS
MCA200.1	S-35	NOT USED
MCA200.1	S-36	MISCELLANEOUS DETAILS



## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

MCA200.1	S-37	REINFORCING PLAN & ELEVATIONS
MCA200.1	S-38	NOT USED
MCA200.1	S-39	NOT USED

## MONOLITH SM-5

MCA200.1	S-40	PLAN AND ELEVATIONS
MCA200.1	S-41	NOT USED
MCA200.1	S-42	NOT USED
MCA200.1	S-43	REINFORCING PLAN & ELEVATIONS
MCA200.1	S-44	NOT USED
MCA200.1	S-45	NOT USED

## MONOLITH SM-6

MCA200.1	S-46	PLAN AND ELEVATIONS
MCA200.1	S-47	SECTIONAL ELEVATIONS
MCA200.1	S-48	MISCELLANEOUS DETAILS
MCA200.1	S-49	REINFORCING PLAN & ELEVATIONS
MCA200.1	S-50	REINFORCING DETAILS
MCA200.1	S-51	MONOLITH SM6, SM7, & SM21 REINFORCING DETAILS

## MONOLITH SM-7

MCA200.1	S-52	PLAN AND ELEVATIONS
MCA200.1	S-53	SECTIONAL ELEVATIONS
MCA200.1	S-54	NOT USED
MCA200.1	S-55	REINFORCING PLAN & ELEVATIONS
MCA200.1	S-56	REINFORCING DETAILS
MCA200.1	S-57	REINFORCING DETAILS

## MONOLITH L-1

MCA200.1	S-58	PLAN AND ELEVATIONS
MCA200.1	S-59	NOT USED
MCA200.1	S-60	NOT USED
MCA200.1	S-61	REINFORCING PLAN & ELEVATIONS
MCA200.1	S-62	NOT USED
MCA200.1	S-63	NOT USED

## MONOLITH L-2

MCA200.1	S-64	PLAN AND ELEVATIONS
MCA200.1	S-65	SECTIONAL ELEVATIONS
MCA200.1	S-66	MISCELLANEOUS DETAILS
MCA200.1	S-67	REINFORCING PLAN & ELEVATIONS
MCA200.1	S-68	NOT USED
MCA200.1	S-69	NOT USED

## MONOLITH L-3

MCA200.1	S-70	PLAN AND ELEVATIONS
MCA200.1	S-71	NOT USED
MCA200.1	S-72	MISCELLANEOUS DETAILS
MCA200.1	S-73	REINFORCING PLAN & ELEVATIONS
MCA200.1	S-74	NOT USED
MCA200.1	S-75	NOT USED

## MONOLITH L-4

MCA200.1	S-76	PLAN AND ELEVATIONS
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## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

MCA200.1	S-77	NOT USED
MCA200.1	S-78	NOT USED
MCA200.1	S-79	REINFORCING PLAN & ELEVATIONS
MCA200.1	S-80	NOT USED
MCA200.1	S-81	NOT USED

## MONOLITH SM-18

MCA200.1	S-82	PLAN AND ELEVATIONS
MCA200.1	S-83	SECTIONAL ELEVATIONS
MCA200.1	S-84	MISCELLANEOUS DETAILS
MCA200.1	S-85	REINFORCING PLAN & ELEVATIONS
MCA200.1	S-86	REINFORCING DETAILS
MCA200.1	S-87	STAIR DETAILS

## MONOLITH SM-19

MCA200.1	S-88	PLAN AND ELEVATIONS
MCA200.1	S-89	SECTIONAL ELEVATIONS
MCA200.1	S-90	MISCELLANEOUS DETAILS
MCA200.1	S-91	REINFORCING PLAN & SECTIONS
MCA200.1	S-92	REINFORCING DETAILS
MCA200.1	S-93	REINFORCING DETAILS

## MONOLITH SM-20

MCA200.1	S-94	PLAN AND ELEVATIONS
MCA200.1	S-95	SECTIONAL ELEVATIONS
MCA200.1	S-96	NOT USED
MCA200.1	S-97	REINFORCING PLAN & ELEVATIONS
MCA200.1	S-98	REINFORCING DETAILS
MCA200.1	S-99	NOT USED

## MONOLITH SM-21

MCA200.1	S-100	PLAN AND ELEVATIONS
MCA200.1	S-101	SECTIONAL ELEVATIONS
MCA200.1	S-102	MESCELLANEOUS DETAILS
MCA200.1	S-103	REINFORCING PLAN & ELEVATIONS
MCA200.1	S-104	REINFORCING DETAILS
MCA200.1	S-105	REINFORCING DETAILS

## MONOLITH SM-22

MCA200.1	S-106	PLAN AND ELEVATIONS
MCA200.1	S-107	SECTIONAL ELEVATIONS
MCA200.1	S-108	NOT USED
MCA200.1	S-109	REINFORCING PLAN & ELEVATIONS
MCA200.1	S-110	BRIDGE PIER REINFORCING
MCA200.1	S-111	NOT USED

## MONOLITH SM-23

MCA200.1	S-112	PLAN AND ELEVATIONS
MCA200.1	S-113	SECTIONAL ELEVATIONS
MCA200.1	S-113A	INTAKE SECTION AND DETAILS
MCA200.1	S-114	REINFORCING PLAN & ELEVATIONS
MCA200.1	S-115	REINFORCING DETAILS
MCA200.1	S-116	NOT USED
MCA200.1	S-117	INTAKE DETAILS

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

MCA200.1	S-118	ROOF EXTENSION DETAILS
	MONOLITH	L-16
MCA200.1	S-119	PLAN AND ELEVATIONS
MCA200.1	S-120	SECTIONAL ELEVATIONS
MCA200.1	S-121	MISCELLANEOUS DETAILS
MCA200.1	S-122	REINFORCING PLAN & ELEVATIONS
MCA200.1	S-123	REINFORCING DETAILS
MCA200.1	S-124	NOT USED
	MONOLITH	L-17
MCA200.1	S-125	PLAN AND ELEVATIONS
MCA200.1	S-126	SECTIONAL ELEVATIONS
MCA200.1	S-127	MISCELLANEOUS DETAILS
MCA200.1	S-128	REINFORCING PLAN & SECTION
MCA200.1	S-129	REINFORCING PLAN & SECTIONS
MCA200.1	S-130	NOT USED
	MONOLITH	L-18
MCA200.1	S-131	PLAN AND ELEVATIONS
MCA200.1	S-132	SECTIONAL ELEVATIONS
MCA200.1	S-133	NOT USED
MCA200.1	S-134	REINFORCING PLAN & ELEVATIONS
MCA200.1	S-135	REINFORCING DETAILS
MCA200.1	S-136	NOT USED
	MONOLITH	L-19
MCA200.1	S-137	PLAN AND ELEVATIONS
MCA200.1	S-138	SECTIONAL ELEVATIONS
MCA200.1	S-139	NOT USED
MCA200.1	S-140	REINFORCING PLAN & ELEVATIONS
MCA200.1	S-141	NOT USED
MCA200.1	S-142	NOT USED
	MONOLITH	L-20
MCA200.1	S-143	PLAN AND ELEVATIONS
MCA200.1	S-144	SECTIONAL ELEVATIONS
MCA200.1	S-145	NOT USED
MCA200.1	S-146	REINFORCING PLAN & ELEVATIONS
MCA200.1	S-147	BRIDGE PIER REINFORCING
MCA200.1	S-148	NOT USED
	MONOLITH	L-21
MCA200.1	S-149	PLAN AND ELEVATIONS
MCA200.1	S-150	SECTIONAL ELEVATIONS
MCA200.1	S-151	NOT USED
MCA200.1	S-152	REINFORCING PLAN & ELEVATIONS
MCA200.1	S-153	NOT USED
MCA200.1	S-154	NOT USED
	MONOLITH	L-22
MCA200.1	S-155	PLAN AND ELEVATIONS
MCA200.1	S-156	SECTIONAL ELEVATIONS
MCA200.1	S-157	NOT USED

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

MCA200.1	S-158	REINFORCING PLAN & ELEVATIONS
MCA200.1	S-159	NOT USED
MCA200.1	S-160	NOT USED

## MONOLITH L-23

MCA200.1	S-161	PLAN AND ELEVATIONS
MCA200.1	S-162	SECTIONAL ELEVATIONS
MCA200.1	S-163	NOT USED
MCA200.1	S-164	REINFORCING PLAN & ELEVATIONS
MCA200.1	S-165	NOT USED
MCA200.1	S-166	NOT USED

## MONOLITH L-24

MCA200.1	S-167	PLAN AND ELEVATIONS
MCA200.1	S-168	SECTIONAL ELEVATIONS
MCA200.1	S-169	INTAKE DETAILS
MCA200.1	S-170	REINFORCING PLAN & ELEVATIONS
MCA200.1	S-171	NOT USED
MCA200.1	S-172	NOT USED
MCA200.1	S-173	NOT USED

## MONOLITH L-25

MCA200.1	S-174	PLAN AND ELEVATIONS
MCA200.1	S-175	SECTIONAL ELEVATIONS
MCA200.1	S-176	INTAKE DETAILS
MCA200.1	S-177	REINFORCING PLAN & ELEVATIONS

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## MONOLITH M31 &amp; M32

<b>MCA200.1</b>	<b>S-177A</b>	<b>STABILIZATION OF M31 &amp; M32</b>
<b>MCA200.1</b>	<b>S-177B</b>	<b>STABILIZATION OF M31 &amp; M32</b>
<b>MCA200.1</b>	<b>S-177C</b>	<b>ROCK ANCHORAGE - LOAD TRANSFER SYSTEM</b>

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## MANHOLE BULKHEADS

MCA200.1	S-178	TRENCH BULKHEAD DETAILS
MCA200.1	S-179	TRENCH BULKHEAD DETAILS
MCA200.1	S-180	TRENCH BULKHEAD DETAILS
MCA200.1	S-180A	TRENCH BULKHEAD DETAILS

## ROLLER COMPACTED CONCRETE MONOLITHS

MCA200.1	S-181	RCC WALLS PLAN & ELEVATIONS
MCA200.1	S-182	RCC WALLS SECTIONAL ELEVATIONS
MCA200.1	S-183	MONOLITH SM-8 PLAN AND ELEVATIONS
MCA200.1	S-184	MONOLITH SM-9 PLAN AND ELEVATIONS
MCA200.1	S-185	MONOLITH SM-10 PLAN AND ELEVATIONS
MCA200.1	S-186	MONOLITH SM-11 PLAN AND ELEVATIONS
MCA200.1	S-187	MONOLITH SM-12 PLAN AND ELEVATIONS
MCA200.1	S-188	MONOLITH SM-13 PLAN AND ELEVATIONS
MCA200.1	S-189	MONOLITH SM-14 PLAN AND ELEVATIONS
MCA200.1	S-190	MONOLITH SM-15 PLAN AND ELEVATIONS
MCA200.1	S-191	MONOLITH SM-16 PLAN AND ELEVATIONS
MCA200.1	S-192	MONOLITH SM-17 PLAN AND ELEVATIONS
MCA200.1	S-193	MONOLITH L-5 PLAN AND ELEVATIONS
MCA200.1	S-194	MONOLITH L-6 PLAN AND ELEVATIONS
MCA200.1	S-195	MONOLITH L-7 PLAN AND ELEVATIONS

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

MCA200.1	S-196	MONOLITH L-8 PLAN AND ELEVATIONS
MCA200.1	S-197	MONOLITH L-9 PLAN AND ELEVATIONS
MCA200.1	S-198	MONOLITH L-10 PLAN AND ELEVATIONS
MCA200.1	S-199	MONOLITH L-11 PLAN AND ELEVATIONS
MCA200.1	S-200	MONOLITH L-12 PLAN AND ELEVATIONS
MCA200.1	S-201	MONOLITH L-13 PLAN AND ELEVATIONS
MCA200.1	S-202	MONOLITH L-14 PLAN AND ELEVATIONS
MCA200.1	S-203	MONOLITH L-15 PLAN AND ELEVATIONS
MCA200.1	S-204	HIGH MAST LIGHTING SUPPORT DETAILS
MCA200.1	S-205	UTILITY TRENCH REINFORCEMENT DETAILS
MCA200.1	S-206	RCC MONOLITH LIFT DETAILS
MCA200.1	S-207	RCC PLACEMENT PROCEDURE
MCA200.1	S-208	RCC PROCEDURE SEQUENCE
MCA200.1	S-209	WATER STOP & JOINT DETAILS FOR RCC MONOLITHS
MCA200.1	S-210	INTERFACE DETAILS FOR RCC MONOLITHS
MCA200.1	S-211	WALL ARMOR DETAILS FOR RCC MONOLITHS

## SILLS

MCA200.1	S-212	U/S MITER GATE SILLS - PLAN
MCA200.1	S-212A	D/S MITER GATE SILLS - PLAN AND SECTION
MCA200.1	S-213	U/S & D/S BULKHEAD SILL STEEL REINFORCEMENT
MCA200.1	S-214	MITER GATE SILLS -EMBEDDED METALS
MCA200.1	S-214A	MITER GATE SILL PLAN-EMBEDDED METALS
MCA200.1	S-215	NOT USED
MCA200.1	S-216	NOT USED

## FILLING AND EMPTYING SYSTEM

MCA200.1	S-217	LOCK PLAN WITH CULVERTS
MCA200.1	S-218	PROFILE AT CENTERLINE LOCK
MCA200.1	S-219	ENLARGED PARTIAL PLAN
MCA200.1	S-220	ENLARGED PARTIAL PLAN
MCA200.1	S-221	ENLARGED PARTIAL PLAN
MCA200.1	S-222	ENLARGED PARTIAL PLAN
MCA200.1	S-223	CULVERTS - SECTIONS AND DETAILS
MCA200.1	S-224	CULVERTS - SECTIONS AND DETAILS
MCA200.1	S-225	CULVERTS - BAFFLES AND PORT EXTENSIONS
MCA200.1	S-226	CULVERTS - REINFORCING SECTIONS AND DETAILS
MCA200.1	S-227	CULVERTS - REINFORCING SECTIONS AND DETAILS
MCA200.1	S-228	CULVERTS - JOINT DETAILS
MCA200.1	S-229	NOT USED
MCA200.1	S-230	NOT USED
MCA200.1	S-231	OUTLET DIFFUSER - PLAN AND SECTIONS
MCA200.1	S-232	OUTLET DIFFUSER - SECTIONS AND DETAILS
MCA200.1	S-233	NOT USED
MCA200.1	S-234	OUTLET DIFFUSER - REINFORCING SECTIONS AND DETAILS
MCA200.1	S-235	OUTLET DIFFUSER - REINFORCING SECTIONS AND DETAILS

VOLUME 2            CULVERT VALVES,  
MITER GATES,MECHANICAL AND ELECTRICAL SYSTEMS,  
APPROACH WALLS,SERVICE BUILDINGS,ACCESS BRIDGE,  
OVERLOOK,VISITORS AREA AND MISCELLANEOUS METALS

MCA450.1	X-1A	COVER SHEET VOLUME 2
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## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

## LOCK MECHANICAL SYSTEMS

MCA200.1	M-1	HYDRAULIC AND UTILITY PIPING
MCA200.1	M-2	HYDRAULIC AND UTILITY PIPING
MCA200.1	M-3	HYDRAULIC AND UTILITY PIPING DETAILS AND SECTIONS
MCA200.1	M-4	HYDRAULIC AND UTILITY PIPING DETAILS AND SECTIONS
MCA200.1	M-5	HYDRAULIC AND UTILITY PIPING DETAILS AND SECTIONS
MCA200.1	M-6	HYDRAULIC AND UTILITY PIPING DETAILS AND SECTIONS
MCA200.1	M-7	HYDRAULIC AND UTILITY PIPING DETAILS AND SECTIONS
MCA200.1	M-8	HYDRAULIC AND UTILITY PIPING DETAILS AND SECTIONS
MCA200.1	M-9	MANHOLE ELEVATIONS
MCA200.1	M-10	MANHOLE ELEVATIONS
MCA200.1	M-11	MANHOLE ELEVATIONS
MCA200.1	M-12	MANHOLE ELEVATIONS
MCA200.1	M-13	MANHOLE ELEVATIONS
MCA200.1	M-14	MANHOLE ELEVATIONS
MCA200.1	M-15	MANHOLE ELEVATIONS
MCA200.1	M-16	MANHOLE PLANS
MCA200.1	M-17	MANHOLE PLANS
MCA200.1	M-18	MANHOLE PLANS
MCA200.1	M-19	MANHOLE PLANS
MCA200.1	M-19A	MISCELLANEOUS MANHOLE DETAILS
MCA200.1	M-20	AIR, AND WATER OUTLET DETAIL
MCA200.1	M-21	ESPLANADE WATER AND SEWAGE PIPING

## INSTRUMENTATION

MCA440.1	I-1	GENERAL PLAN SHEET 1 OF 2
MCA440.1	I-2	GENERAL PLAN SHEET 2 OF 2
MCA440.1	I-3	STRAIN GAUGE/THERMISTORS PLACEMENT SM-2
MCA440.1	I-4	STRAIN GAUGE/THERMISTORS PRESSURE CELL PLACEMENT
L-11		
MCA440.1	I-5	STRAIN GAUGE/THERMISTORS PRESSURE CELL PLACEMENT
SM-15		
MCA440.1	I-6	STRAIN GAUGE/THERMISTORS PRESSURE CELL PLACEMENT
L-22		
MCA440.1	I-7	MOVEMENT PINS - DETAILS
MCA440.1	I-8	OPEN STAND PIPE PIEZOMETERS - DETAILS
MCA440.1	I-9	VIBRATING WIRE/THERMISTOR DETAILS
MCA440.1	I-10	LOAD CELL DETAIL
MCA440.1	I-11	PRESSURE CELL DETAILS
MCA440.1	I-12	AUTOMATED DATA ACQUISITION SYSTEM - SCHEMATIC

## LOCK ELECTRICAL SYSTEMS

MCA200.1	E-15	480 VOLT CABLE ROUTING(SHEET 1 OF 2)
MCA200.1	E-15A	480 VOLT CABLE ROUTING(SHEET 2 OF 2)
MCA200.1	E-16	120 VOLT CABLE ROUTING
MCA200.1	E-17	DATA CABLE ROUTING
MCA200.1	E-18	CABLE SCHEDULE
MCA200.1	E-19	CABLE SCHEDULE
MCA200.1	E-19A	CABLE SCHEDULE
MCA200.1	E-19B	CABLE SCHEDULE
MCA200.1	E-20	ONE LINE DIAGRAM

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

MCA200.1	E-21	ONE LINE DIAGRAM
MCA200.1	E-22	TRENCH LAYOUT (SH. 1 OF 4)
MCA200.1	E-22A	TRENCH LAYOUT (SH. 2 OF 4)
MCA200.1	E-23	TRENCH LAYOUT (SH. 3 OF 4)
MCA200.1	E-23A	TRENCH LAYOUT (SH. 4 OF 4)
MCA200.1	E-24	MONOLITH ELECTRICAL DETAILS
MCA200.1	E-25	MONOLITH ELECTRICAL DETAILS
MCA200.1	E-26	MONOLITH ELECTRICAL DETAILS
MCA200.1	E-27	MONOLITH ELECTRICAL DETAILS
MCA200.1	E-28	MONOLITH ELECTRICAL DETAILS
MCA200.1	E-29	MONOLITH ELECTRICAL DETAILS
MCA200.1	E-30	GROUNDING PLAN

## LOCK LIGHTING

MCA200.1	E-31	LOCK CHAMBER LIGHTING PLAN
MCA200.1	E-32	AIMING CHART AND LIGHTING PLAN
MCA200.1	E-33	APPROACH WALL LIGHTING DETAILS
MCA200.1	E-34	FIXTURE AND POLE SCHEDULE
MCA200.1	E-35	HIGH MAST LIGHTING DETAILS
MCA200.1	E-36	LIGHTING DETAILS
MCA200.1	E-37	NOT USED

## U.S. APPROACH WALL

MCA210.1	S-236	ALT. 1 PLAN AND ELEVATION
MCA210.1	S-237	ALT. 1 INTERIOR PIERS, PIER CAPS, BUTTRESS
MCA210.1	S-237A	ALT. 1 INTERIOR PIERS - PIER CAP FORM - PLAN & ELEVATION
MCA210.1	S-237B	ALT. 1 PIER CAP FORM - DETAILS
MCA210.1	S-237C	ALT. 1 INTERIOR PIERS - REINFORCING DETAILS
MCA210.1	S-237D	ALT. 1 PIER CAP - REINFORCING STEEL
MCA210.1	S-237E	ALT. 1 PIER CAP - REINFORCING STEEL
MCA210.1	S-237F	ALT. 2 PLAN AND ELEVATION
MCA210.1	S-237G	ALT. 2 INTERIOR PIERS, BUTTRESS
MCA210.1	S-237H	ALT. 2 INTERIOR PIERS REINFORCING DETAILS
MCA210.1	S-237I	ALT. 2 SHEET PILE CELL
MCA210.1	S-238	END CELL
MCA210.1	S-238B	PRECAST CONCRETE BEAMS - LONGITUDINAL PLAN & SECTIONS
MCA210.1	S-238C	PRECAST CONCRETE BEAMS - SECTIONS
MCA210.1	S-238D	PRECAST CONCRETE BEAMS - END ELEVATION AND PLAN
MCA210.1	S-238E	LADDER DETAILS

## D.S. APPROACH WALL

MCA210.1	S-239	ALT. 1 PLAN & ELEVATION
MCA210.1	S-239B	ALT. 1 INTERIOR PIERS, PIER CAPS BUTTRESS
MCA210.1	S-239C	ALT. 1 INTERIOR PIERS, PIER CAP FORM - PLAN & ELEVATION
MCA210.1	S-239E	ALT. 1 PIER CAP FORM - DETAILS
MCA210.1	S-239F	ALT. 1 INTERIOR PIERS - REINFORCING DETAILS
MCA210.1	S-239G	ALT. 1 INTERIOR PIERS - REINFORCING DETAILS
MCA210.1	S-239H	ALT. 1 PIER CAP - REINFORCING STEEL
MCA210.1	S-239I	ALT. 1 PIER CAP - REINFORCING STEEL

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

MCA210.1	S-239J	ALT. 2 PLAN AND ELEVATION
MCA210.1	S-239K	ALT. 2 INTERIOR PIERS, BUTTRESS
MCA210.1	S-239L	ALT. 2 INTERIOR PIERS REINFORCING DETAILS
MCA210.1	S-239M	ALT. 2 INTERIOR PIERS REINFORCING DETAILS
MCA210.1	S-239N	ALT. 2 SHEET PILE CELL
MCA210.1	S-240	NOT USED
MCA210.1	S-241	END CELL
MCA210.1	S-242	PRECAST CONCRETE BEAMS - LONGITUDINAL PLAN & SECTIONS
MCA210.1	S-242A	PRECAST CONCRETE BEAMS - SECTIONS
MCA210.1	S-242B	PRECAST CONCRETE BEAMS - END ELEVATION AND PLAN

## APPROACH WALL

MCA210.1	S-245	NOT USED
MCA210.1	S-246	UPSTREAM ALT. 1 CONSTRUCTION SEQUENCE
MCA210.1	S-246A	DOWNSTREAM ALT. 1 CONSTRUCTION SEQUENCE
MCA210.1	S-247	ALT. 1 CONSTRUCTION SEQUENCE
MCA210.1	S-247A	ALT. 1 SEAL COLLAR DETAILS
MCA210.1	S-247B	ALT. 2 CONSTRUCTION SEQUENCE
MCA210.1	S-248	NOT USED

## CULVERT VALVE AND BULKHEAD

## CULVERT VALVE

MCA220.1	S-249	ARRANGEMENT
MCA220.1	S-250	TRUNNION ANCHORAGE
MCA220.1	S-251	TRUNNION BEAM & DETAILS
MCA220.1	S-252	ELEVATION, SECTIONS & DETAILS
MCA220.1	S-253	TRUNNION BEARING DETAILS
MCA220.1	S-254	SKIN PLATE & DETAILS
MCA220.1	S-255	SEALS AND CLAMPING BAR
MCA220.1	S-256	NOT USED
MCA220.1	S-257	NOT USED
MCA220.1	S-258	SIDE, TOP & BOTTOM SEALS & ANCHORAGES
MCA220.1	S-258A	NOT USED
MCA220.1	S-259	EMBEDDED METALS
MCA220.1	S-260	NOT USED
MCA220.1	E-38	CATHODIC PROTECTION
MCA220.1	M-22	CULVERT VALVE MACHINERY ASSEMBLY
MCA220.1	M-23	CULVERT VALVE MACHINERY DETAILS
MCA220.1	M-24	CULVERT VALVE MACHINERY DETAILS

## CULVERT BULKHEAD

MCA220.1	S-261	PLAN , ELEVATION AND DETAILS
MCA220.1	S-262	DETAILS
MCA220.1	S-263	PICKUP FRAME AND DETAILS
MCA220.1	S-264	BULKHEAD RECESSES - EMBEDDED METALS
MCA220.1	S-265	BULKHEAD RECESS DETAILS
MCA220.1	S-265A	NOT USED

## SEALING DIAPHRAGM

MCA220.1	S-266	SEALING DIAPHRAGM & EMBEDDED METALS
MCA220.1	S-267	JACKING ASSEMBLY/PLATES



## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

## INTAKE SCREENS

MCA220.1	S-268	INTAKE SCREENS & LIFTING ASSEMBLY - SM23
MCA220.1	S-268A	INTAKE SCREENS & LIFTING ASSEMBLY - L24 & L25
MCA220.1	S-268B	INTAKE SCREENS & LIFTING ASSEMBLY DETAILS
MCA220.1	S-269	SOUTH WALL SCREEN GUIDES- PLAN & DETAILS
MCA220.1	S-270	SOUTH WALL SCREEN GUIDES- SECTIONS & DETAILS
MCA220.1	S-271	SOUTH WALL SCREEN GUIDES- SECTIONS & DETAILS
MCA220.1	S-272	NOT USED
MCA220.1	S-273	NORTH WALL SCREEN GUIDES - PLAN & DETAILS
MCA220.1	S-274	NORTH WALL SCREEN GUIDES - SECTIONS & DETAILS
MCA220.1	S-275	NOT USED

## MITER GATES

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MCA230.1	S-276	DESIGN CRITERIA
MCA230.1	S-276A	OUTLINE AND RECESS
MCA230.1	S-277	DOWNSTREAM ELEVATION
MCA230.1	S-278	UPSTREAM ELEVATION
MCA230.1	S-279	TOP GIRDER PLAN
MCA230.1	S-280	INTERMEDIATE GIRDER PLAN
MCA230.1	S-281	BOTTOM GIRDER PLAN
MCA230.1	S-282	GIRDER DETAILS (SHEET 1 0f 2)
MCA230.1	S-282A	GIRDER DETAILS (SHEET 2 0f 2)
MCA230.1	S-283	MISCELLANEOUS DETAILS
MCA230.1	S-283A	GATE LIFTER DETAILS
MCA230.1	S-284	CYLINDER CONNECTION DETAILS
MCA230.1	S-285	CYLINDER CONNECTION COMPONENTS
MCA230.1	S-286	INBOARD POSITIVE DIAGONAL ANCHORAGE DETAIL
MCA230.1	S-287	OUTBOARD NEGATIVE DIAGONAL ANCHORAGE DETAIL
MCA230.1	S-288	DIAGONAL DETAILS
MCA230.1	S-289	DIAGONAL PRESTRESSING
MCA230.1	S-290	PINTLE LAYOUT
MCA230.1	S-291	PINTLE BASE
MCA230.1	S-292	NOT USED
MCA230.1	S-293	PINTLE SOCKET DETAILS
MCA230.1	S-294	PINTLE SOCKET
MCA230.1	S-295	SEALS DETAILS (SHEET 1 OF 2)
MCA230.1	S-296	SEAL DETAILS (SHEET 2 OF 2)
MCA230.1	S-297	NOT USED
MCA230.1	S-298	ANCHORAGE ASSEMBLY
MCA230.1	S-299	EMBEDDED ANCHORAGE
MCA230.1	S-300	EMBEDDED ANCHORAGE DETAILS
MCA230.1	S-301	GUDGEON ANCHOR LINKAGE
MCA230.1	S-302	GUDGEON ANCHOR LINKAGE
MCA230.1	S-303	GUDGEON DETAILS
MCA230.1	S-304	ANCHORAGE PARTS LIST AND GENERAL NOTES
MCA230.1	S-305	EMBEDDED WALL QUOIN
MCA230.1	S-306	EMBEDDED WALL QUOIN
MCA230.1	S-307	ADJUSTABLE QUOIN BLOCK ASSEMBLY
MCA230.1	S-308	ADJUSTABLE QUOIN END VIEWS
MCA230.1	S-308A	ADJUSTABLE QUOIN SIDE VIEWS
MCA230.1	S-308B	ADJUSTABLE MITER BLOCK ASSEMBLY

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

MCA230.1	S-308C	ADJUSTABLE MITER BLOCK END VIEWS
MCA230.1	S-308D	ADJUSTABLE MITER BLOCK SIDE VIEWS
MCA230.1	S-308E	ADJUSTABLE QUOIN & MITER BLOCK PARTS LIST
MCA230.1	S-308F	EMBEDDED WALL QUOIN PARTS LIST
MCA230.1	S-309	FENDER ELEVATIONS
MCA230.1	S-310	FENDER DETAILS (SHEET 1 OF 2)
MCA230.1	S-311	FENDER DETAILS (SHEET 2 OF 2)
MCA230.1	S-312	RECESS LATCH
MCA230.1	S-313	MITER DEVICE AND LATCH
MCA230.1	S-314	MITERING DEVICE DETAILS
MCA230.1	S-315	MITER LATCH DETAILS
MCA230.1	S-316	BRIDGE FRAMING (SHEET 1 of 2)
MCA230.1	S-317	BRIDGE FRAMING (SHEET 2 of 2)
MCA230.1	S-318	BRIDGE GRATING AND GUARDRAILS
MCA230.1	S-319	BRIDGEWAY FRAMING & GUARDRAIL DETAILS
MCA230.1	S-320	GUARDRAIL DETAILS
MCA230.1	S-321	BRIDGEWAY GRATING
MCA230.1	E-39	MITER GATE SWITCH PLAN
MCA230.1	E-40	MITER GATE SWITCH DETAILS
MCA230.1	E-41	MITER GATE SWITCH DETAILS
MCA230.1	E-42	NOT USED
MCA230.1	E-43	NOT USED
MCA230.1	E-44	CATHODIC PROTECTION
MCA230.1	E-45	CATHODIC PROTECTION
MCA230.1	M-25	MITER GATE MACHINERY GENERAL ARRANGEMENT
MCA230.1	M-26	<b>MITER GATE CYLINDER</b>
MCA230.1	M-27	GATE LATCHING DEVICE ASSEMBLY
MCA230.1	M-28	GATE LATCHING DEVICE DETAILS
MCA230.1	M-29	GATE LATCHING DEVICE COVER PLATES DETAILS
MCA230.1	M-30	<b>NOT USED</b>

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## MECHANICAL SYSTEMS

MCA240.1	M-31	HYDRAULIC SYSTEM SCHEMATIC
MCA240.1	M-32	HYDRAULIC VALVE MANIFOLD DETAILS
MCA240.1	M-33	NOT USED
MCA240.1	M-34	MITER GATE BUBBLER SYSTEM
MCA240.1	M-35	NOT USED
MCA240.1	M-36	HOSE CABINETS
MCA240.1	M-37	FIREHOSE CABINETS
MCA240.1	M-38	UTILITY PIPING WET WELL DETAILS
MCA240.1	M-39	UTILITY PIPING WET WELL DETAILS

## ELECTRICAL SYSTEMS

## CCTV SYSTEM

MCA250.1	E-46	CCTV SYSTEM BLOCK DIAGRAM
MCA250.1	E-47	CCTV SYSTEM PLAN

## COMMUNICATIONS

MCA250.1	E-47A	COMMUNICATION DETAILS
MCA250.1	E-47B	COMMUNICATION DETAILS
MCA250.1	E-47C	COMMUNICATION DETAILS

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## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

## CONTROLS

MCA250.1	E-48	PLC SYMBOLS & ABBREVIATIONS
MCA250.1	E-49	PLC SYMBOLS & ABBREVIATIONS
MCA250.1	E-50	COMMUNICATIONS SYSTEMS OVERVIEW
MCA250.1	E-51	PLC CONTROL SYSTEM OVERVIEW
MCA250.1	E-52	REMOTE I/O SYSTEM OVERVIEW
MCA250.1	E-53	MAIN PLC & REMOTE I/O SYSTEM
MCA250.1	E-54	TRAFFIC SIGNAL SCHEMATICS
MCA250.1	E-55	HIGH MAST LIGHTING CONTROL NORTH WALL
MCA250.1	E-56	HIGH MAST LIGHTING CONTROL SOUTH WALL
MCA250.1	E-57	APPROACH WALL LIGHTS
MCA250.1	E-58	DISCHARGE AREA LIGHTS & SIREN
MCA250.1	E-59	SCHEMATICS DOWNSTREAM MITER GATES & CULVERT VALVES
MCA250.1	E-60	SCHEMATICS UPSTREAM MITER GATES & CULVERT VALVES
MCA250.1	E-61	BUBBLER & LIGHTING CONTROL
MCA250.1	E-62	SUMP PUMP CONTROL CIRCUIT
MCA250.1	E-63	PUMP CONTROL
MCA250.1	E-64	PUMP CONTROL
MCA250.1	E-65	WATER LEVEL SENSING SYSTEM
MCA250.1	E-66	SEWAGE & UTILITY PUMP SCHEMATIC
MCA250.1	E-67	GENERATOR AND ATS SCHEMATIC
MCA250.1	E-68	LOCK SENSOR AND LIMIT SWITCH LOCATION PLAN
MCA250.1	E-69	GRAPHIC DISPLAY SYSTEM
MCA250.1	E-70	GRAPHIC DISPLAY SYSTEM
MCA250.1	E-71	MISCELLANEOUS DETAILS
MCA250.1	E-72	MANUAL CONTROLS LADDER DIAGRAM
MCA250.1	E-73	MANUAL CONTROLS LADDER DIAGRAM
MCA250.1	E-74	MANUAL CONTROLS LADDER DIAGRAM
MCA250.1	E-74A	MANUAL CONTROLS LADDER DIAGRAM
MCA250.1	E-74B	MANUAL CONTROLS LADDER DIAGRAM
MCA250.1	E-74C	MANUAL CONTROLS LADDER DIAGRAM
MCA250.1	E-74D	MANUAL CONTROLS LADDER DIAGRAM
MCA250.1	E-74E	MANUAL CONTROLS PANEL LAYOUT & DETAILS
MCA250.1	E-74F	MANUAL CONTROLS LADDER DIAGRAM
MCA250.1	E-74G	MANUAL CONTROLS LADDER DIAGRAM
MCA250.1	E-74H	MANUAL CONTROLS PANEL LAYOUT & DETAILS
MCA250.1	E-74I	MANUAL CONTROLS - D/S MANUAL CONTROL PANEL LAYOUT
MCA250.1	E-74J	MANUAL CONTROLS - RELAY PANEL A LAYOUT
MCA250.1	E-74K	MANUAL CONTROLS - RELAY PANEL C LAYOUT
MCA250.1	E-74L	MANUAL CONTROLS - RELAY PANELS B & D LAYOUT
MCA250.1	E-74M	MANUAL CONTROLS - RELAY PANEL A TERMINAL LAYOUT
MCA250.1	E-74N	MANUAL CONTROLS - RELAY PANEL C TERMINAL LAYOUT
MCA250.1	E-74O	MANUAL CONTROLS - RELAY PANELS B & D TERMINAL LAYOUT
MCA250.1	E-74P	MANUAL CONTROLS - MANUAL CONTROL PANELS TERMINAL LAYOUT
MCA250.1	E-74Q	CULVERT VALVE SENSOR AND SWITCH ASSEMBLY ( SHEET 1 OF 4 )
MCA250.1	E-74R	CULVERT VALVE SENSOR AND SWITCH ASSEMBLY ( SHEET 2 OF 4 )
MCA250.1	E-74S	CULVERT VALVE SENSOR AND SWITCH ASSEMBLY ( SHEET 3 OF 4 )
MCA250.1	E-74T	CULVERT VALVE SENSOR AND SWITCH ASSEMBLY ( SHEET 4 OF 4 )

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## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

## ACCESS BRIDGE

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MCA380.1	S-322	PLAN & ELEVATION - 1
MCA380.1	S-323	PLAN & ELEVATION - 2
MCA380.1	S-324	PLAN & ELEVATION - 3
MCA380.1	S-325	PLAN & ELEVATION - 4
MCA380.1	S-326	PLAN & ELEVATION - 5
MCA380.1	S-327	GENERAL NOTES
MCA380.1	S-328	ABUTMENT NO. 1 PLAN & ELEVATION
MCA380.1	S-329	ABUTMENT NO. 2 PLAN & ELEVATION
MCA380.1	S-330	ABUTMENT DETAILS
MCA380.1	S-331	WINGWALL ELEVATIONS
MCA380.1	S-332	WINGWALL SECTIONS
MCA380.1	S-333	PIERS 1, 2, 3 DETAILS
MCA380.1	S-334	PIER 4 DETAILS
MCA380.1	S-335	PIER 5, 6, 7 DETAILS
MCA380.1	S-336	PIER 8 DETAILS
<b>MCA380.1</b>	<b>S-336A</b>	<b>PIER 8 DETAILS - 2</b>
<b>MCA380.1</b>	<b>S-336B</b>	<b>PIER 8 DETAILS - 3</b>
MCA380.1	S-337	PIER 8 FDN. DETAILS
<b>MCA380.1</b>	<b>S-337A</b>	<b>POWERHOUSE DEMOLITION DETAILS</b>
<b>MCA380.1</b>	<b>S-337B</b>	<b>POWERHOUSE DEMOLITION DETAILS</b>
MCA380.1	S-338	PIERS 9 & 13 DETAILS
MCA380.1	S-339	PIERS 10, 11, 12 DETAILS
MCA380.1	S-340	PIERS 9 & 10 FDN. DETAILS
MCA380.1	S-341	PIER 11 FDN. DETAILS
MCA380.1	S-342	PIERS 12 & 13 FDN. DETAILS - 1
MCA380.1	S-342A	PIERS 12 & 13 FDN. DETAILS - 2
MCA380.1	S-343	PIER 14 -17 DETAILS
MCA380.2	S-343A	PIERS 18 & 19 DETAILS
MCA380.1	S-344	FRAMING PLANS SHEET 1
MCA380.1	S-345	FRAMING PLANS SHEET 2
MCA380.1	S-346	FRAMING PLANS SHEET 3
MCA380.1	S-347	FRAMING PLANS SHEET 4
MCA380.1	S-348	FRAMING PLANS SHEET 5
MCA380.1	S-349	DIAPHRAGM DETAILS-1
MCA380.1	S-349A	DIAPHRAGM DETAILS-2
MCA380.1	S-349B	DIAPHRAGM DETAILS-3
MCA380.1	S-350	SUPER STRUCTURE I-BEAM SECTIONS
MCA380.1	S-351	SUPER STRUCTURE BEAM DATA TABLE
MCA380.1	S-352	SUPER STRUCTURE BEAM ELEVATION
MCA380.2	S-352A	SUPER STRUCTURE BEAM NOTES
MCA380.1	S-353	TRANSVERSE SECTIONS - 1
MCA380.1	S-354	TRANSVERSE SECTIONS - 2
MCA380.1	S-355	DECK SLAB REINFORCING PLAN - 1
MCA380.1	S-356	DECK SLAB REINFORCING PLAN - 2
MCA380.1	S-357	DECK SLAB REINFORCING PLAN - 3
MCA380.1	S-358	DECK SLAB REINFORCING PLAN - 4
MCA380.1	S-359	DECK SLAB REINFORCING PLAN - 5
MCA380.1	S-360	CONSTRUCTION ELEVATIONS - 1
MCA380.1	S-361	CONSTRUCTION ELEVATIONS - 2
MCA380.1	S-362	CONSTRUCTION ELEVATIONS - 3
MCA380.2	S-362A	CONSTRUCTION ELEVATIONS - 4
MCA380.3	S-362B	CONSTRUCTION ELEVATIONS - 5

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

MCA380.1	S-363	BEARING PAD DETAILS	1
MCA380.1	S-364	BEARING PAD DETAILS	2
MCA380.1	S-365	DECK JOINT DETAILS	- 1
MCA380.1	S-366	DECK JOINT DETAILS	- 2
MCA380.1	S-367	DRAINAGE DETAILS	- 1
MCA380.1	S-368	DRAINAGE DETAILS	- 2
MCA380.1	S-369	UTILITY PLANS SHEET	1
MCA380.1	S-369A	UTILITY PLANS SHEET	2
MCA380.1	S-370	UTILITY PLANS SHEET	3
MCA380.1	S-371	UTILITY DETAILS	- 1
MCA380.1	S-372	UTILITY DETAILS	- 2
MCA380.1	S-373	UTILITY DETAILS	- 3
MCA380.1	S-374	FENCE / RAIL DETAILS	- 1
MCA380.1	S-374A	FENCE / RAIL DETAILS	- 2
MCA380.1	S-374B	FENCE / RAIL DETAILS	- 3
MCA380.1	S-374C	FENCE / RAIL DETAILS	- 4
MCA380.1	S-374D	APPROACH SLAB DETAILS	

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## SERVICE BUILDINGS

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## BUILDING A

MCA420.1	A-1	1ST,MEZZANINE, 2ND & 3RD FLOOR PLANS
MCA420.1	A-2	1ST, 2ND, 3RD & MEZZANINE FLOOR REFLECTED CEILING
PLANS & ROOF PLAN		
MCA420.1	A-3	BUILDING ELEVATIONS
MCA420.1	A-4	BUILDING SECTIONS
MCA420.1	A-5	WALL SECTIONS
MCA420.1	A-6	WALL SECTIONS AND DETAILS
MCA420.1	A-7	DOOR & WINDOW DETAILS
MCA420.1	A-8	ROOM FINISH SCHEDULE & INTERIOR SECTIONS &
ELEVATIONS		
MCA420.1	A-9	STAIR SECTIONS AND DETAILS
MCA420.1	A-10	MISCELLANEOUS DETAILS
MCA420.1	A-10A	MISCELLANEOUS DETAILS
MCA420.1	A-10B	MISCELLANEOUS DETAILS
<b>MCA420.1</b>	<b>A-10C</b>	<b>SIGNAGE SCHEDULE AND DETAILS</b>
<b>MCA420.1</b>	<b>LS-1</b>	<b>LIFE SAFETY/FIRE PROTECTION CODE REVIEW</b>
MCA420.1	LS-2	LIFE SAFETY/FIRE PROTECTION FLOOR PLANS
MCA420.1	S-375	STRUCTURAL NOTES BLDG. A,B,C & D
MCA420.1	S-376	FLOOR PLANS
MCA420.1	S-377	ROOF FRAMING PLAN
MCA420.1	S-378	ELEVATIONS
MCA420.1	S-379	WALL SECTIONS
MCA420.1	S-380	CANOPY ROOF FRAMING PLAN
MCA420.1	S-380A	SECTIONS & DETAILS
MCA420.1	S-380B	SECTIONS & DETAILS
MCA420.1	E-75	LIGHTING PLANS
MCA420.1	E-76	POWER PLANS
MCA420.1	E-76A	ENLARGED PLANS & DETAILS
MCA420.1	E-77	MCC ELEVATIONS & DETAILS
MCA420.1	E-78	LIGHTING DETAILS
MCA420.1	E-79	LIGHTING DETAILS
MCA420.1	E-80	SCHEDULES
MCA420.1	E-81	LIGHTNING PROTECTION PLAN

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

MCA420.1	E-82	LIGHTNING PROTECTION DETAILS
MCA420.1	M-40	MECHANICAL EQUIPMENT LAYOUT
MCA420.1	M-41	HVAC PLANS
MCA420.1	M-42	HVAC DETAILS
MCA420.1	M-43	PLUMBING AND SANITARY PLANS
MCA420.1	M-44	PLUMBING AND SANITARY DETAILS
MCA420.1	M-45	AIR, RAW WATER & HYD. PLANS & DETAILS
MCA420.1	M-46	AIR, RAW WATER AND HYDRAULIC PIPING
MCA420.1	M-47	NOT USED
MCA420.1	M-48	NOT USED
MCA420.1	M-49	NOT USED
MCA420.1	M-50	NOT USED
MCA420.1	M-51	NOT USED
MCA420.1	M-52	MECHANICAL EQUIPMENT SCHEDULES

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## BUILDING B

MCA420.1	A-11	1ST AND 2ND FLOOR PLANS & ROOF PLAN
MCA420.1	A-12	ELEVATIONS
MCA420.1	A-13	BUILDING SECTIONS & DETAILS
MCA420.1	A-13A	WALL SECTIONS & DETAILS
MCA420.1	S-381	1st. & 2nd. FLOOR PLANS & ROOF FRAMING PLAN
MCA420.1	S-381A	ELEVATIONS
MCA420.1	S-381B	WALL SECTIONS
MCA420.1	S-381C	SECTIONS & DETAILS
MCA420.1	S-381D	SECTIONS & DETAILS
MCA420.1	E-83	ELECTRICAL PLANS
MCA420.1	E-84	MCC ELEVATIONS & DETAILS
MCA420.1	E-85	ELECTRICAL PLANS
MCA420.1	E-86	NOT USED
MCA420.1	E-87	SCHEDULES
MCA420.1	E-88	LIGHTNING PROTECTION PLAN
MCA420.1	E-89	LIGHTNING PROTECTION DETAILS
MCA420.1	M-53	MECHANICAL EQUIPMENT LAYOUT
MCA420.1	M-54	AIR, RAW WATER & HYD. PIPING, PLANS & DETAILS
MCA420.1	M-55	AIR, RAW WATER AND HYDRAULIC PIPING
MCA420.1	M-56	VENTILATION PLANS AND DETAILS
MCA420.1	M-57	NOT USED
MCA420.1	M-58	NOT USED
MCA420.1	M-59	MECHANICAL EQUIPMENT SCHEDULE
MCA420.1	M-59A	FUEL OIL STORAGE
MCA420.1	M-59B	GENERATOR DETAILS
MCA420.1	M-59C	GENERATOR DETAILS

## BUILDING C

MCA420.1	A-14	FLR PLAN, ROOF PLAN & BLDG SECTIONS
MCA420.1	A-15	ELEVATIONS AND DETAILS
MCA420.1	A-15A	SHIP LADDER AND HORIZONTAL COLD JOINT DETAILS
MCA420.1	A-16	WALL SECTIONS & DETAILS
MCA420.1	S-382	FLOOR PLAN & ROOF FRAMING PLAN
MCA420.1	S-382A	SECTIONS
MCA420.1	S-382B	DETAILS
MCA420.1	E-90	ELECTRICAL PLANS
MCA420.1	E-91	MCC ELEVATIONS & DETAILS
MCA420.1	E-92	NOT USED

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

MCA420.1	E-93	NOT USED
MCA420.1	E-94	SCHEDULES
MCA420.1	E-95	LIGHTNING PROTECTION PLAN
MCA420.1	E-96	LIGHTNING PROTECTION DETAILS
MCA420.1	M-60	MECHANICAL EQUIPMENT LAYOUT BUILDING "C"
MCA420.1	M-61	HYDRAULIC PIPING, PLANS AND DETAILS
MCA420.1	M-62	NOT USED
MCA420.1	M-63	VENTILATION PLANS AND DETAILS
MCA420.1	M-64	NOT USED
MCA420.1	M-65	NOT USED
MCA420.1	M-66	NOT USED
MCA420.1	M-67	MECHANICAL EQUIPMENT SCHEDULES

## BUILDING D

MCA420.1	A-17	FLR PLAN, ROOF PLAN & BLDG SECTIONS
MCA420.1	A-18	ELEVATIONS & DETAILS
MCA420.1	A-19	WALL SECTIONS & DETAILS
MCA420.1	S-383	FLOOR PLAN & ROOF FRAMING PLAN
MCA420.1	S-383A	SECTIONS
MCA420.1	S-383B	DETAILS
MCA420.1	E-97	ELECTRICAL PLANS
MCA420.1	E-98	MCC ELEVATIONS & DETAILS
MCA420.1	E-99	NOT USED
MCA420.1	E-100	NOT USED
MCA420.1	E-101	SCHEDULES
MCA420.1	E-102	LIGHTNING PROTECTION PLAN
MCA420.1	E-103	LIGHTNING PROTECTION DETAILS
MCA420.1	M-68	MECHANICAL EQUIPMENT LAYOUT
MCA420.1	M-69	HYDRAULIC PIPING, PLANS AND DETAILS
MCA420.1	M-70	NOT USED
MCA420.1	M-71	VENTILATION PLANS AND DETAILS
MCA420.1	M-72	NOT USED
MCA420.1	M-73	NOT USED
MCA420.1	M-74	MECHANICAL EQUIPMENT SCHEDULES

## OVERLOOK PAVILION

MCA420.1	C-82	PLAN AND ELEVATION
MCA420.1	S-383C	PIER DETAILS
MCA420.1	S-383D	PIER DETAILS
MCA420.1	S-383E	DECK SLAB PLAN & REINFORCING
MCA420.1	S-383F	EXPANSION JOINT DETAILS
MCA420.1	S-383G	RAILING PLAN
MCA420.1	S-383H	DECK OVERLAY DETAILS
MCA420.1	S-383I	WALL LAYOUT & DETAILS
MCA420.1	S-383J	CANOPY ROOF FRAMING PLAN
MCA420.1	S-383K	CANOPY ROOF DETAILS
MCA420.1	S-383L	NOT USED
MCA420.1	S-383M	NOT USED
MCA420.1	S-383N	NOT USED
MCA420.1	S-383O	NOT USED
MCA420.1	S-383P	NOT USED
MCA420.1	S-383Q	NOT USED
MCA420.1	S-383R	NOT USED
MCA420.1	E-104	ELECTRICAL PLAN AND DETAILS

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

## VISITORS AREA AND RIVER WALK

MCA420.1	C-83	SITE PLAN
MCA420.1	C-84	GRADING PLAN
MCA420.1	A-25	PLAN
MCA420.1	A-26	DETAILS
MCA420.1	E-105	PLAN
MCA420.1	E-106	DETAILS

## MISCELLANEOUS METALS

MCA440.1	S-384	WALL ARMOR & CORNER PROTECTION
MCA440.1	S-384A	MISCELLANEOUS ARMOR AND CORNER PROTECTION
MCA440.1	S-385	MITER GATE CYLINDER MOUNTING BASE
MCA440.1	S-386	TYPICAL REINFORCING DETAIL - WALL ACCESSORIES
MCA440.1	S-387	LINE HOOK & CHECK POST SECTIONS AND DETAILS
MCA440.1	S-388	LINE HOOK & CHECKPOST REINFORCING DETAILS
MCA440.1	S-389	NOT USED
MCA440.1	S-390	STAFF GAGES DETAILS
MCA440.1	S-391	NOT USED
MCA440.1	S-392	NOT USED
MCA440.1	S-393	LADDER RECESS DETAILS
MCA440.1	S-394	MONOLITH BULKHEAD LADDER DETAILS
MCA440.1	S-395	HANDRAIL DETAILS
MCA440.1	S-396	HANDRAIL DETAILS
MCA440.1	S-397	HANDRAIL DETAILS
MCA440.1	S-398	NOT USED
MCA440.1	S-399	NOT USED
MCA440.1	S-400	TRENCH DETAILS
MCA440.1	S-401	MANHOLE CAP DETAILS
MCA440.1	S-401A	MANHOLE CAP DETAILS
MCA440.1	S-402	MANHOLE CAP DETAILS
MCA440.1	S-403	MISCELLANEOUS RECESS DETAILS
MCA440.1	S-404	NOT USED
MCA440.1	S-405	MAINT. BULKHEAD RECESS DETAILS MONOLITHS L2, L17, SM3, & SM19
MCA440.1	S-406	MAINT. BULKHEAD RECESS DETAILS MONOLITHS L4, L19, SM5, & SM21
MCA440.1	S-407	FLOATING MOORING BITT RECESS ANCHORAGE
MCA440.1	S-408	FLOATING MOORING BITT RECESS DETAILS
MCA440.1	S-409	FLOATING MOORING BITT RECESS GRATING & STOP BEAM

## FLOATING MOORING BITTS

MCA440.1	M-75	GENERAL ARRANGEMENT AND DETAILS
MCA440.1	M-76	DETAILS (SHEET 1 OF 2)
MCA440.1	M-77	DETAILS (SHEET 2 OF 2)

VOLUME 3 GEOTECHNICAL  
INFORMATION AND HYDROGRAPHS

MCA450.1	X-1B	COVER SHEET VOLUME 3
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## GEOTECHNICAL INFORMATION



## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

MCA450.1	G-1	BORING LOCATION PLAN
MCA450.1	G-2	SOILS CLASSIFICATION
MCA450.1	G-3	BORING LOGS DC-3
MCA450.1	G-4	BORING LOGS DC-4
MCA450.1	G-5	BORING LOGS DC-5, DC-28, DC-52
MCA450.1	G-6	BORING LOGS D-11, FC-15
MCA450.1	G-7	BORING LOGS DC-15A
MCA450.1	G-8	BORING LOGS DFC-16
MCA450.1	G-9	BORING LOGS DC-17
MCA450.1	G-10	BORING LOGS DFC-18
MCA450.1	G-11	BORING LOGS DC-19
MCA450.1	G-12	BORING LOGS DC-20
MCA450.1	G-13	BORING LOGS DC-31
MCA450.1	G-14	BORING LOGS DC-32
MCA450.1	G-15	BORING LOGS DC-33, DC-34
MCA450.1	G-16	BORING LOGS DC-35
MCA450.1	G-17	BORING LOGS C-36
MCA450.1	G-18	BORING LOGS WC-37, WC-38
MCA450.1	G-19	BORING LOGS C-40, FC-41
MCA450.1	G-20	BORING LOGS FC-42, C-43
MCA450.1	G-21	BORING LOGS C-44, C-45
MCA450.1	G-22	BORING LOGS C-46, C-47A
MCA450.1	G-23	BORING LOGS C-48, C-50
MCA450.1	G-24	BORING LOGS DC-53, DC-59
MCA450.1	G-25	BORING LOGS C-51, WC-60
MCA450.1	G-26	BORING LOGS WC-61, DC-156
MCA450.1	G-27	BORING LOGS WC-62, C-63
MCA450.1	G-28	BORING LOGS DC-157
MCA450.1	G-29	BORING LOGS DC-158
MCA450.1	G-30	BORING LOGS DC-159
MCA450.1	G-31	BORING LOGS DC-160
MCA450.1	G-32	BORING LOGS DC-163, DC-164
MCA450.1	G-33	BORING LOGS C-172, C-173
MCA450.1	G-34	BORING LOGS FC-212
MCA450.1	G-35	BORING LOGS RC-213
MCA450.1	G-36	BORING LOGS ADC-1001
MCA450.1	G-37	BORING LOGS ADC-1002
MCA450.1	G-38	BORING LOGS ADC-1003
MCA450.1	G-39	BORING LOGS ADC-1004
MCA450.1	G-40	BORING LOGS DC-1005B
MCA450.1	G-41	BORING LOGS DC-1006
MCA450.1	G-42	BORING LOGS DC-1007
MCA450.1	G-43	BORING LOGS DC-1008
MCA450.1	G-44	BORING LOGS ADC-1009
MCA450.1	G-45	BORING LOGS ADC-1010
MCA450.1	G-46	BORING LOGS AC-1011
MCA450.1	G-47	BORING LOGS AC-1012
MCA450.1	G-48	BORING LOGS AC-1013
MCA450.1	G-49	BORING LOGS AC-1014
MCA450.1	G-50	BORING LOGS ADC-1015
MCA450.1	G-51	BORING LOGS ADC-1016
MCA450.1	G-52	BORING LOGS PZ-1017
MCA450.1	G-53	BORING LOGS PZ-1018
MCA450.1	G-54	BORING LOGS ADC-2001, AS-2001

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

MCA450.1	G-55	BORING LOGS AD-2002, AD-2003
MCA450.1	G-56	BORING LOGS AD-2004
MCA450.1	G-57	BORING LOGS AS-2004, AD-2005
MCA450.1	G-58	BORING LOGS AD-2006, AS-2006
MCA450.1	G-59	BORING LOGS RC-2006
MCA450.1	G-60	BORING LOGS ADC-2007, AD-2009
MCA450.1	G-61	BORING LOGS AS-2010, AS-2010a, AD-2010
MCA450.1	G-62	BORING LOGS ADC-2011, ADC-2012, AD-2013
MCA450.1	G-63	BORING LOGS AD-2014, AFC-2015, ADC-2016
MCA450.1	G-64	BORING LOGS AD-2017, ADC-2018, ADC-2019
MCA450.1	G-65	BORING LOGS ADC-2020, AD-2021
MCA450.1	G-66	BORING LOGS ADC-2022, AD-2023
MCA450.1	G-67	BORING LOGS AC-2025
MCA450.1	G-68	BORING LOGS ADC-2026, AD-2027
MCA450.1	G-69	BORING LOGS AD-2028
MCA450.1	G-70	BORING LOGS ADC-2050, AD-2051
MCA450.1	G-71	BORING LOGS ADC-3000
MCA450.1	G-72	BORING LOGS ADC-3001
MCA450.1	G-73	BORING LOGS ADC-3002
MCA450.1	G-74	BORING LOGS AD-3003
MCA450.1	G-75	BORING LOGS AD-3004
MCA450.1	G-76	BORING LOGS AD-3005D
MCA450.1	G-77	BORING LOGS ADC-3006
MCA450.1	G-78	BORING LOGS AD-3007
MCA450.1	G-79	BORING LOGS ADC-4000, ADC-4001
MCA450.1	G-80	BORING LOGS ADC-4002, ADC-4003
MCA450.1	G-81	BORING LOGS ADC-4004, ADC-4005
MCA450.1	G-82	BORING LOGS ADC-4006, ADC-4007
MCA450.1	G-83	BORING LOGS ADC-4008
MCA450.1	G-84	BORING LOGS ADC-4009, ADC-4009a
MCA450.1	G-85	BORING LOGS, ADC-4010, ADC-4010a
MCA450.1	G-86	BORING LOGS ADC-4011
MCA450.1	G-87	BORING LOGS ADC-4012
MCA450.1	G-88	BORING LOGS ADC-4013
MCA450.1	G-89	BORING LOGS ADC-4014, ADC-4014a
MCA450.1	G-90	BORING LOGS ADC-4015, ADC-4015a
MCA450.1	G-91	BORING LOGS AC-5001
MCA450.1	G-92	BORING LOGS AC-5002
MCA450.1	G-93	BORING LOGS AC-5003
MCA450.1	G-94	BORING LOGS AC-5004
MCA450.1	G-95	BORING LOGS AC-5005
MCA450.1	G-96	BORING LOGS AC-5006

## HYDROGRAPHS

MCA460.1	H-1	HYDROGRAPHS UPPER POOL 1983-1986
MCA460.1	H-2	HYDROGRAPHS UPPER POOL 1987-1990
MCA460.1	H-3	HYDROGRAPHS UPPER POOL 1991-1994
MCA460.1	H-4	HYDROGRAPHS UPPER POOL 1995-1998
MCA460.1	H-4A	HYDROGRAPHS UPPER POOL 1999-2001
MCA460.1	H-5	HYDROGRAPHS LOWER POOL 1983-1986
MCA460.1	H-6	HYDROGRAPHS LOWER POOL 1987-1990
MCA460.1	H-7	HYDROGRAPHS LOWER POOL 1991-1994
MCA460.1	H-8	HYDROGRAPHS LOWER POOL 1995-1998
MCA460.1	H-9	HYDROGRAPHS LOWER POOL 1999-2001

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

## VOLUME 4

## REFERENCE DRAWINGS

MCA100.1 X-1C COVER SHEET VOLUME 4

## LOCK &amp; DAM NO. 41

5 OF 8	1	MAIN LOCK STONEY GATE VALVE CONTROL
41-100.3/7	2	LOCK, CANAL & DETAIL OF FINISHED SLOPES
41-100.3/8	3	LOCK, CANAL & DETAIL OF FINISHED SLOPES
41-110.1/1	4	NORTH SIDE ENLARGEMENT
41-110.2/1	5	CANAL-SECTIONS OF SOUTH CANAL WALL
41-110.3/1	6	CANAL-PLAN, SECTION AND ELEVATION OF UPPER GUARD WALL
41-110.5/1	7	SOUTH CANAL WALL-RECORD OF PROGRESS TO MARCH 17, 1915
41-110.7/1	8	CHANGES TO STRUCTURES AT L.P. CANAL FOR UPPER POOL AT
		POOL AT 418.0 & 420.0
41-120.20/2	9	RECORD PLAN OF DRY DOCK CULVERT
41-131.1/1	10	PLAN AND ELEVATION OF PIER AND ABUTMENTS FOR SWING BRIDGE AT HEAD OF LOCKS
41-131.2/1	11	DESIGN AND STRESS SHEET
41-131.3/1	12	GENERAL ARRANGEMENT OF OPERATING MACHINERY AND WEDGES AT CENTER
41-131.4/1	13	GENERAL ARRANGEMENT OF END WEDGES
41-131.5/1	14	DETAIL OF OPERATOR'S HOUSE
41-131.6/1	15	ALTERATIONS TO END PIERS
41-131.7/1	16	PROPOSED TRAFFIC LIGHTS
41-220.2/1	17	SURFACE DRAIN FOR ESPLANADE
41-220.2/2	18	REPAIRS TO SOUTH ESPLANADE PAVING
41-220.3/1	19	ESPLANADE WATER PIPING BEHIND SOUTH WALL
41-220.4/1	20	GENERAL ARRANGEMENT OF PIPES ON LOCK WALLS
41-220.5/1	21	GENERAL ARRANGEMENT OF PIPES IN MANHOLES AND CONDUIT
41-220.6/1	22	DETAILS OF SUPPORTS FOR PIPES IN TRENCHES AND CONDUIT
41-220.7/1	23	GENERAL ARRANGEMENT OF PIPES AND SUPPORTS IN TRENCHES ON NORTH LOCK WALL
41-220.8/1	24	GENERAL ARRANGEMENT OF PIPES AND SUPPORTS IN TRENCHES ON SOUTH LOCK WALL
41-220.11/1	25	PIPING TO MITER FORCING MACHINE LOWER GATE
41-220.15/1	26	HORIZONTAL LAYOUT OF LINES AT STONEY GATE VALVE
41-220.16/1	27	HORIZONTAL LAYOUT OF PRESSURE AND RETURN LINES ON LOCK WALLS
41-220.17/1	28	HORIZONTAL LAYOUT OF LINES IN ESPLANADE & CONDUIT AND ON GATES
41-300.1/1	29	LOWER ENTRANCE TO LOCK-EXTENSION TO GUIDE WALL
41-300.2/1	30	LOWER ENTRANCE TO LOCK-LEDGE EXCAVATION
41-300.3/1	31	LOCK SOUTH WALL AT UPPER GATE
41-300.4/1	32	LOCK-SOUTH WALL BETWEEN GATES
41-300.5/1	33	LOCK-SOUTH WALL AT LOWER GATE

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

41-300.6/1	34	LOCK-NORTH WALL AT UPPER GATE
41-300.7/1	35	NORTH WALL OF LOCK-CRACKS IN ROCK FOUNDATION
41-300.8/1	36	LOCK-NORTH WALL BETWEEN GATES
41-300.9/1	37	LOCK-NORTH WALL STA. 0+20.04 TO STA. 2+92.5A
41-300.10/1	38	LOCK-NORTH WALL AT LOWER GATE
41-300.11/1	39	LOCK-NORTH LOWER GUARD WALL
41-300.12/1	40	LOCK-SOUTH LOWER GUIDE WALL
41-300.12/2.1	41	RAISING & EXTENDING LOWER GUIDE WALL PLAN, ELEVATION AND SECTIONS
41-300.12/3	42	RAISING & EXTENDING LOWER GUIDE WALL DESIGN DATA
41-300.12/4	43	RAISING & EXTENDING LOWER GUIDE WALL CONSTRUCTION DETAILS
41-300.12/5	44	RAISING & EXTENDING LOWER GUIDE WALL MISCELLANEOUS DETAILS
41-300.13/1	45	PLAN, SECTION AND ELEVATIONS OF STONEY GATE VALVE HOUSE FOR NORTH AND SOUTH WALLS AT UPPER GATE
41-300.14/1	46	LOWER GATE RECESS COVER, SOUTH WALL
41-300.15/1	47	LOWER GATE RECESS COVER, NORTH WALL
41-300.16/1	48	UPPER GATE RECESS COVER, SOUTH WALL
41-300.17/1	49	UPPER GATE RECESS COVER, NORTH WALL
41-300.18/1	50	DETAILS OF STEPS AND REMOVABLE CONCRETE BLOCKS IN END WALL OF STONEY GATE HOUSE
41-300.19/1	51	POIREE DAM DETAIL OF FOUNDATION & TRESTLE BOXES
41-300.20/1	52	UPPER POIREE DAM FOUNDATION
41-300.23/1	53	SCREENS, LADDERS, CHECK POSTS AND MOORING HOOKS
41-300.23/2	54	REPLACEMENT OF MOORING HOOK WITH MOORING PIN CASTING
41-300.23/3	55	MOORING PIN CASTING
41-300.24/1	56	SOUTH BRIDGE APPROACH
41-300.25/1	57	CONCRETE GUARD RAIL FOR SOUTH BRIDGE APPROACH
41-300.26/1	58	DETAILS FOR STEEL CANTILEVERS FOR LOWER GATE RECESS, SOUTH WALL
41-300.27/1	59	DETAILS OF STEEL FOR LOWER GATE RECESS NORTH AND SOUTH WALLS
41-300.28/1	60	DETAILS OF STEEL FOR UPPER GATE RECESS COVERS, NORTH AND SOUTH WALLS
41-300.20/1	61	COVER PLATES FOR MANHOLES, VALVE RECESSES AND PIPE TRENCHES
41-300.30/1	62	COVER PLATES FOR PIPE TRENCHES
41-300.31/1	63	COVER PLATES FOR GATE JACK TRENCHES
41-300.32/1	64	GENERAL ARRANGEMENT OF COVER PLATES ON NORTH WALL
41-300.33/1	65	GENERAL ARRANGEMENT OF COVER PLATES ON SOUTH WALL
41-300.35/1	66	LOCK WALL HAND RAILING-PLAN & INSTALLATION DETAILS
41-300.35/2	67	LOCK WALL HAND RAILING-RAILING DETAILS
41-300.37/1	68	FLOODLIGHTING-MAIN & AUX. LOCK GATE AREAS - GENERAL PLAN AND DETAILS
41-300.38/1	69	NOT USED
41-300.39/4	70	FLOATING MOORING BITT-LOCATION OF EMBEDDED METAL ITEMS
41-300.39/5	71	FLOATING MOORING BITT NO.3-RELOCATION OF BITT - PLAN, SECTIONS & ELEVATIONS
41-300.40/1	72	MOORING FACILITIES FOR COMMERCIAL TOWS - LOWER END - INT. WALL - MAIN LOCK
41-310.1/1	73	OPERATING MACHINERY FOR GUARD GATE-ASSEMBLY
41-310.2/1	74	GUARD GATE-COVER PLATES AND STRUT

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

41-310.2/1	75	GUARD GATE-MISCELLANEOUS DETAILS
41-310.4/1	76	GUARD GATE-GEARS AND SHAFTS
41-310.5/1	77	LOCK-TRENCH FOR GUARD GATE OPERATING MACHINERY ON NORTH WALL
41-310.6/1	78	LOCK-TRENCH FOR GUARD GATE OPERATING MACHINERY ON SOUTH WALL
41-310.7/1	79	GATE JACK-PLAN AND ELEVATION
41-310.8/1	80	GATE JACK CYLINDER-PLAN, ELEVATIONS AND SECTIONS
41-310.9/1	81	GATE JACK-DETAILS OF CROSSHEAD, GUIDE SHOE, GUDGEON AND FASTENINGS
41-310.10/1	82	DETAILS OF GUIDE YOKE, GUIDE BAR AND CONTROL ROD SUPPORTS
41-310.11/1	83	DETAILS OF CYLINDER HEADS, PISTON, PISTON ROD AND GLANDS
41-310.12/1	84	DETAILS OF OPERATING LEVER, LINK, ROCKER ARM AND SUPPORT
41-310.13/1	85	DETAILS OF BRACKET BEARING, LEVER SEGMENT, RELIEF VALVE, PIPE AND FITTINGS
41-310.14/1	86	FOUR WAY CONTROLLING VALVE ASSEMBLED
41-310.15/1	87	DETAILS OF VALVE CYLINDER, PLUNGER AND BUSHINGS
41-310.16/1	88	AUTOMATIC CONTROL OPERATING LEVER AND VALVE ASSEMBLED
41-310.17/1	89	OPERATING STRUT
41-310.18/1	90	BUFFER SPRINGS, CASING AND COVER FOR OPERATING STRUT
41-310.19/1	91	BUFFER FOR OPERATING STRUT
41-310.20/1	92	ASSEMBLY AND DETAILS OF OPERATING LEVER
41-320.1/1	93	GUARD GATE-STRESS SHEET
41320.2/1	94	GUARD GATE-GENERAL DRAWING
41-320.3/1	95	GUARD GATE-MITER SILL
41-320.4/1	96	GUARD GATE-DETAILS OF QUOIN AND MITER END OF UPPER GIRDERS
41-320.6/1	97	GUARD GATE-VALVE
41-320.7/1	98	GUARD GATE-VALVE DETAILS
41-320.8/1	99	STEEL GUARD GATE-STRESS SHEET
41-320.9/1	100	STEEL GUARD GATE-UPSTREAM ELEVATION
41320.10/1	101	STEEL GUARD GATE-DOWNSTREAM ELEVATION
41-320.11/1	102	STEEL GUARD GATE-PINTLE, ROLLER, ANCHORAGE, BARS, ETC.
41-320.12/1	103	STEEL GUARD GATE-VALVE, QUOIN, BEARINGS, ETC.
41-320.13/1	104	STEEL GUARD GATE-DETAILS OF SILL & GATE TRACK
41-320.15/1	105	STEEL GUARD GATE-DETAILS FOR CAPPING PIERS
41-330.1/1	106	UPPER GATE-STRESS SHEET
41-330.2/1	107	UPPER GATE GENERAL DRAWING
41-330.3/1	108	UPPER GATE-GENERAL PLAN AND DETAILS OF MITER SILL
41-330.4/1	109	UPPER GATE-DETAILS OF QUOIN END OF UPPER GIRDER
41-330.5/1	110	UPPER GATE-AT MITER ENDS OF UPPER GIRDERS
41-330.6/1	111	UPPER GATE-MITER FORCING MACHINE
41-330.7/1	112	LOWER GATES-YOKE, WEDGES, BUSHING AND PINS
41-330.8/1	113	LOCK GATES-HOLLOW QUOIN CASTINGS AND BEARING PLATES
41-330.9/1	114	LOCK GATES-DETAIL OF GATE ANCHORAGE & ANCHOR BOX
41-330.10/1	115	LOWER GATE-STRESS SHEET
41-330.11/1	116	LOWER GATE-GENERAL LAYOUT OF GATE AND RECESSES
41-330.12/1	117	LOWER GATE-GENERAL DRAWING
41-330.14/1	118	LOWER GATE-SUPPORTING GIRDERS

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

41-330.15/1	119	LOWER GATE-QUOIN AND MITER POSTS
41-330.16/1	120	LOWER GATE-MITER GUARD
41-330.18/1	121	LOWER GATE-GENERAL PLAN AND DETAILS OF MITER SILL
41-330.18/2	122	LOWER GATE-NEW TIMBER MITER SILL
41-330.19/1	123	LOWER GATE-HEEL CASTING
41-330.20/1	124	LOWER GATE-LOWER AND UPPER PINTLE CASTINGS, PINTLE AND KEY
41-330.23/1	125	LOWER GATE-FOUNDATION TIGHTENING AND HOLLOW QUOIN CONNECTIONS CASTINGS
41-330.23/1	126	LOWER GATE-UPPER HINGE
41-330.24/1	127	LOWER GATE-MITER FORCING MACHINE
41-330.25/1	128	UPPER AND LOWER GATES-MITER FORCING MACHINE-DETAILS OF PIN CASTINGS AND CYLINDERS
41-330.26/1	129	UPPER AND LOWER GATES-MITER FORCING MACHINE-DETAILS OF MACHINERY CASTINGS AND COVERS
41-330.27/1	130	UPPER AND LOWER GATES-MITER FORCING MACHINE-JAW, LINKS, CROSSHEAD, PINS, VALVE, PISTON AND PISTON ROD
41-330.28/1	131	UPPER AND LOWER GATE-DETAILS OF DISTRIBUTING CONNECTION, MITER AND QUOIN CASTINGS
41-330.29/1	132	UPPER GATE-CONNECTION OF OPERATING STRUT
41-330.30/1	133	LOWER GATE-CONNECTION OF OPERATING STRUT
41-330.31/1	134	LOCK GATES-GATE LATCH
41-330.32/1	135	LOWER GATE-ALTERATION TO LOWER GATE FOR POOL ELEV. 420.0
41-330.33/1	136	LOWER GATE-ALTERATIONS TO LOWER GATE FOR POOL ELEV. 425.0
41-330.34/1	137	UPPER GATE-ALTERATIONS TO UPPER GATE FOR POOL ELEV. 425.0
41-340.1/1	138	STONEY GATE VALVE-OPERATING MACHINERY AND VALVE ASSEMBLED IN SOUTH WALL UPPER GATE
41-340.2/1	139	STONEY GATE VALVE-OPERATING MACHINERY AND VALVE ASSEMBLED IN SOUTH WALL LOWER GATE
41-340.3/1	140	STONEY GATE VALVE-DOWNSTREAM ELEVATION
41-340.4/1	141	STONEY GATE VALVE-PLAN, ELEVATION AND VERTICAL SECTION
41-340.5/1	142	GENERAL ARRANGEMENT OF GATE VALVE OPERATING MACHINERY- NORTH WALL LOWER GATE
41-340.6/1	143	STONEY GATE VALVE-PLAN AND ASSEMBLED SECTIONS SHOWING ALL FIXED IRON WORK FOR VALVE, SOUTH WALL AT UPPER GATE
41-340.7/1	144	STONEY GATE VALVE-PLAN AND ASSEMBLED SECTIONS SHOWING ALL FIXED IRON WORK FOR VALVE, SOUTH WALL AT UPPER GATE
41-340.8/1	145	GENERAL ARRANGEMENT OF GATE AND VALVE OPERATING MACHINERY - NORTH WALL, UPPER GATE
41-340.11/1	146	STONEY GATE VALVE-DETAILS OF CASTINGS AND PARTS ATTACHED TO VALVE BLADES
41-340.12/1	147	STONEY GATE VALVE-DETAILS OF ROLLER TRAIN AND VALVE STEM
41-340.13/3	148	STONEY GATE VALVE-DETAILS & ASSEMBLY OF ROLLER TRAIN
41-340.15/1	149	STONEY GATE VALVE-DETAILS OF WALL CASTING AND BOLTS
41-340.16/1	150	STONEY GATE VALVE-DETAILS OF GATE GUIDES AND ROLLER TRACK IN WALL
41-340.17/1	151	STONEY GATE VALVE-DETAILS OF GUIDES FOR LIFTING

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

## CYLINDERS

41-340.18/1	152	STONEY GATE VALVE-DETAILS OF CYLINDERS, PLUNGERS, PLUNGER BASE AND FASTENINGS
41-340.19/1	153	STONEY GATE VALVE-DETAILS OF VALVE SEAL AND LINTEL CASTING
41-340.20/1	154	STONEY GATE VALVE-DETAILS OF ADJUSTABLE AND SIDE WATER SEALS
41-340.21/1	155	STONEY GATE VALVE-DETAILS OF CROSS ARMS, GLAND AND DIAGONAL BRACING
41-340.22/1	156	STONEY GATE VALVE-ASSEMBLED SECTION OF SHIELDS AND ASSEMBLED VIEWS OF ADJUSTABLE SEALS
41-340.23/1	157	STONEY GATE VALVE-DETAILS AND ASSEMBLED SECTIONS OF CULVERT LINING
41-340.24/1	158	STONEY GATE VALVE-DETAILS OF FLOOR SEAL AND CULVERT LINING
41-340.25/1	159	STONEY GATE VALVE-GENERAL ARRANGEMENT OF LIFTING PLUNGERS AND MOVING PARTS
41-340.26/1	160	VALVE AND GATE JACK-MISCELLANEOUS DETAILS
41-340.27/1	161	STONEY GATE VALVE-GENERAL ARRANGEMENT AND LOCATION OF MACHINERY, NORTH AND SOUTH WALLS AT LOWER GATE
41-340.28/1	162	STONEY GATE VALVE CONTROL-GENERAL ARRANGEMENT & LOCATION OF MACHINERY, NORTH & SOUTH WALLS AT UPPER GATE
41-340.33/1	163	STONEY GATE VALVE CONTROL-DETAILS OF LINKS, BEARINGS AND SHAFTING
41-340.34/1	164	STONEY GATE VALVE CONTROL-DETAILS OF CONTROL ARM, BRACKETS AND STOPS
41-340.35/1	165	STONEY GATE CONTROL-DETAILS OF COUNTERWEIGHT
41-340.36/1	166	STONEY GATE VALVE CONTROL-THREWAY CONTROLLING VALVE ASSEMBLED
41-340.37/1	167	STONEY GATE VALVE CONTROL-VALVE CYLINDER, PLUNGER AND BUSHINGS
41-340.40/1	168	REMOTE CONTROL OF STONEY GATE VALVES AND LOCK GATES - MAIN LOCK - GENERAL PLAN
41-340.40/2	169	REMOTE CONTROL OF STONEY GATE VALVES AND LOCK GATES - MAIN LOCK - WIRING DIAGRAM
41-340.40/3	170	REMOTE CONTROL OF STONEY GATE VALVES AND LOCK GATE - MAIN LOCK - GENERAL LAYOUT OF GATE JACKS
41-340.40/4	171	REMOTE CONTROL OF STONEY GATE VALVES AND LOCK GATES - MAIN LOCK - MISCELLANEOUS DETAILS
41-340.40/5	172	REMOTE CONTROL OF STONEY GATE VALVES AND LOCK GATES - MAIN LOCK - STONEY GATE VALVE CONTROL
41-340.40/6	173	REMOTE CONTROL OF STONEY GATE VALVES AND LOCK GATES - MAIN LOCK - RHEOSTAT BOX - ASSEMBLY & INSTALLATION
41-340.40/7	174	REMOTE CONTROL OF STONEY GATE VALVES AND LOCK GATES - MAIN LOCK - RHEOSTAT BOX DETAILS
41-340.40/8	175	REMOTE CONTROL OF STONEY GATE VALVES AND LOCK GATES - MAIN LOCK - MATERIAL LIST
41-340.40/9	176	REMOTE CONTROL OF STONEY GATE VALVES AND LOCK GATES - MAIN LOCK - REPLACEMENT OF HYDRAULIC CYLINDERS
41-350.1/1	177	LOCK-DETAIL OF VALVE CASING
41-350.2/1	178	LOCK-DETAIL OF VALVE
41-350.3/1	179	BUTTERFLY VALVE-DETAILS OF BASE PLATE, WORM

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

## GEARING, BEARINGS AND BOLTS

41-350.4/1	180	BUTTERFLY VALVE-GENERAL ARRANGEMENT AND LOCATION OF HAND OPERATED VALVE GEARING
41-350.5/1	181	BUTTERFLY VALVE-DETAILS OF RATCHET WRENCH FOR OPERATING VALVE GEARING
41-400.1/1	182	POWER HOUSE ALTERATIONS-ELEVATIONS
41-400.8/1	183	POWER HOUSE-DETAILS OF BASEMENT WALLS, FLOORS AND SLIDING DOOR
41-400.9/1	184	POWER HOUSE-BASEMENT PLAN OF FOUNDATION WALLS AND LOCATION OF MACHINERY
41-400.11/1	185	POWER HOUSE-FIRST FLOOR PLAN AND BASEMENT STAIRS
41-400.13/1	186	POWER HOUSE ALTERATIONS-FLOOR AND ROOF PLANS
41-530.1/1	187	REFERENCE LINES & POINTS
41-530.9/1	188	RECONSTRUCTION OF OLD LOCK-GENERAL PLAN
41-530.10/1	189	PLANT FOR FILLING UPPER CHAMBER OF OLD LOCK TO EL. 401.0±
41-530.11/1	190	AUXILIARY LOCK NO.41-CONCRETE SLAB AT OLD UPPER GATE RECESSES
41-600.1/1	191	AUXILIARY LOCK-SURVEY OF SITE
41-600.3/4	192	LOWER ENTRANCE TO LOCKS-EXCAVATION
41-600.3/5	193	EXCAVATION-CROSS SECTIONS
41-600.3/6	194	EXCAVATION-CROSS SECTIONS
41-600.3/7	195	EXCAVATION-CROSS SECTIONS
41-600.3/8	196	EXCAVATION-CROSS SECTIONS
41-600.3/15	197	LOWER APPROACH TO LOCKS-FINAL CROSS SECTIONS
41-610.1/1	198	AUXILIARY LOCK-ESPLANADE
41-700.1/1	199	AUXILIARY LOCK-GENERAL PLAN
41-700.2/1	200	AUXILIARY LOCK-MASONRY AT UPPER GATES
41-700.3/1	201	AUXILIARY LOCK-MASONRY AT LOWER GATES
41-700.4/1	202	AUXILIARY LOCK-LOWER MITER SILL & POIREE DAM - REVISED PLAN & SECTION
41-700.5/1	203	AUXILIARY LOCK-LOCK WALLS BETWEEN GATES
41-700.6/2	204	AUXILIARY LOCK-LOWER GUIDE WALL
41-700.6/3	205	AUXILIARY LOCK-STABILIZATION OF LOWER GUIDE WALL - PLAN, SECTIONS AND DETAILS
41-700.7/1	206	AUXILIARY LOCK-LOCATION & DETAILS OF POIREE DAM STEEL
41-700.8/1	207	AUXILIARY LOCK-LOCATION OF GATE ANCHORAGES
41-700.9/1	208	AUXILIARY LOCK-DETAILS OF GATE ANCHORAGES
41-700.10/1	209	AUXILIARY LOCK-LOCATION OF MITER SILL STEEL-VERTICAL BEARING CASTINGS AND PINTLE SHOE
41-700.11/1	210	AUXILIARY LOCK-DETAILS OF MITER SILL STEEL-VERTICAL BEARING CASTINGS AND PINTLE SHOE
41-700.11/2	211	AUXILIARY LOCK-LOCATION OF COVER PLATES, ETC.
41-700.12/1	212	AUXILIARY LOCK-DETAILS OF COVER PLATES, ETC.
41-700.12/2	213	AUXILIARY LOCK-DETAILS OF MISCELLANEOUS PARTS
41-700.13/1	214	AUXILIARY LOCK-OPERATORS HOUSE-STONEY GATE VALVE
41-700.13/2	215	AUXILIARY LOCK-UPPER STONEY GATE VALVE HOUSE
41-700.13/3	216	AUXILIARY LOCK-MISCELLANEOUS PARTS FOR STONEY GATE VALVE & OPERATORS HOUSES
41-700.14/1	217	AUXILIARY LOCK-LOCATION OF VENTS
41-700.14/1A	218	PRECAST CONCRETE PIPE FITTINGS VENT PIPE DRAINAGE SYSTEM - AUXILIARY LOCK
41-700.15/1	219	AUXILIARY LOCK-LIGHTING LAYOUT



## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

41-700.16/1	220	AUXILIARY LOCK-LIST OF METAL PARTS
41-700.16/2	221	AUXILIARY LOCK-LIST OF METAL PARTS
41-700.16/3	222	AUXILIARY LOCK-LIST OF METAL PARTS
41-710.1/1	223	AUXILIARY LOCK-GATE OPERATING MACHINERY-ASSEMBLY
41-710.2/1	224	AUXILIARY LOCK-GATE OPERATING MACHINERY-SECTOR ARM, ETC. AUXILIARY LOCK-GATE OPERATING MACHINERY - OPERATING
41-710.3/1	225	STRUT & MISCELLANEOUS PARTS
41-710.4/1	226	AUXILIARY LOCK-GATE OPERATING MACHINERY-CYLINDER, PISTON, ETC.
41-710.5/1	227	AUXILIARY LOCK-GATE OPERATING MACHINERY-CYLINDER BASE, SECTOR BASE, ETC.
41-720.2/1	228	AUXILIARY LOCK-STONEY GATE VALVE-LOWER VALVE & OPERATING MACHINERY ASSEMBLED IN SOUTH WALL
41-720.3/1	229	AUXILIARY LOCK-STONEY GATE VALVE-DOWNSTREAM ELEVATION & SECTIONS
41-720.8/1	230	AUXILIARY LOCK-STONEY GATE VALVE-CASTINGS & PARTS ATTACHED TO VALVE BLADE
41-720.9/1	231	AUXILIARY LOCK-STONEY GATE VALVE-ROLLER TRAIN & VALVE STEM
41-720.9/1.1	232	AUXILIARY LOCK-STONEY GATE VALVE-DETAILS & ASSEMBLY OF ROLLER TRAIN
41-720.10/1	233	AUXILIARY LOCK-STONEY GATE VALVE-WALL CASTINGS, ETC.
41-720.11/1	234	AUXILIARY LOCK-STONEY GATE VALVE-GATE GUIDES & ROLLER TRACK
41-720.12/1	235	AUXILIARY LOCK-STONEY GATE VALVE-CYLINDER GUIDES & SUPPORTS
41-720.14/1	236	AUXILIARY LOCK-STONEY GATE VALVE-CYLINDERS, PLUNGER, PLUNGER BASE AND GASTENINGS
41-720.14/1	237	AUXILIARY LOCK-STONEY GATE VALVE-VALVE SEAL & LINTEL CASTINGS
41-720.15/1	238	AUXILIARY LOCK-STONEY GATE VALVE-SIDE WATER SEALS, ETC.
41-720.15/2	239	AUXILIARY LOCK-STONEY GATE VALVE-DETAILS OF SIDE WATER SILLS
41-720.16/1	240	AUXILIARY LOCK-STONEY GATE VALVE-SHIELDS & RUBBING STRIPS
41-720.17/1	241	AUXILIARY LOCK-STONEY GATE VALVE-FLOOR SEAL & CULVERT LINING
41-720.18/1	242	AUXILIARY LOCK-STONEY GATE VALVE-ASSEMBLED PLAN & ELEVATION OF CONTROL VALVES
41-720.19/1	243	AUXILIARY LOCK-STONEY GATE VALVE-LINKS, BEARINGS & SHAFTING
41-720.20/1	244	AUXILIARY LOCK-STONEY GATE VALVE-CONTROL ARM, BRACKETS & STOPS
41-720.21/1	245	AUXILIARY LOCK-STONEY GATE VALVE-COUNTERWEIGHT & MISCELLANEOUS PARTS
41-720.22/1	246	AUXILIARY LOCK-STONEY GATE VALVE-THREE WAY CONTROLLING VALVE ASSEMBLED
41-720.23/1	247	AUXILIARY LOCK-STONEY GATE VALVE-VALVE CYLINDER, PLUNGER & BUSHINGS
41-730.1/1	248	AUXILIARY LOCK-LOCK GATES-UPPER GATE
41-730.1/2	249	AUXILIARY LOCK-LOCK GATES-UPPER GATE
41-730.2/1	250	AUXILIARY LOCK-LOCK GATES-LOWER GATE

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

41-730.3/1	251	AUXILIARY LOCK-LOCK GATES- LOWER GATE
41-730.4/1	252	AUXILIARY LOCK-LOCK GATES-QUOIN & MITER BEARING CASTINGS
41-730.5/1	253	AUXILIARY LOCK-LOCK GATES-MITER WATER SEAL
41-730.6/1	254	AUXILIARY LOCK-
41-730.7/1	255	AUXILIARY LOCK-LOCK GATES-STRESS SHEET
3738SHT7	256	LINK & CAM MECHANISM FOR LOCK & END WEDGES
3738SHT9	257	MAIN DRIVE BED PLATE
A19242	258	264 FT. SINGLE TRACK R.R. SWING BRIDGE, AT 26TH. STREET
A19243	259	MACHINERY & CENTER GIRDER FOR 26TH. STREET R.R. SWING BRIDGE
A19244	260	DEAD LOAD STRESS DIAGRAM FOR 264' SINGLE TRACK R.R. SWING SWING BRIDGE AT 26TH.
A19245	261	LIVE LOAD STRESSES FOR 26TH. ST. SINGLE TRACK R.R. SWING BRIDGE
A19246	262	LIVE LOAD STRESSES FOR 26TH. ST. SINGLE TRACK R.R. SWING BRIDGE
A19247	263	OPERATOR'S HOUSE FOR 26TH. ST. R.R. SWING BRIDGE
A19297	264	PLAN AND SECTION OF BRIDGE FLOOR
B19191	265	ELEVATIONS FOR 26TH. STREET DRAW BRIDGE
CA-4074	266	GYROL FLUID DRIVE LAYOUT FOR TURN BRIDGE
CA-4075	267	ANCHOR BOLT PLAN & ELEVATIONS CA4076
CA-4076	268	DETAILS OF SUPPORTS FOR DRIVE, SPEED REDUCERS & BEARINGS
CA-5711	269	REMOVABLE SECTION FOR BRIDGE FLOOR
CB-4069	270	DETAIL OF BEVEL PINION GEARS
CB-5149	271	RELOCATE 13.8 KV CIRCUIT
D-19324	272	PROPOSED COMBINATION HIGHWAY & SINGLE TRACK R.R. SWING BRIDGE OVER LOUISVILLE 7 PORTLAND CANAL LOCK AT 26TH. ST.
SWB1	273	ASSEMBLY & DETAILS OF CHANGES REQUIRED FOR LOCKING DEVICE
SWB2	274	NOT USED
OR41A.FP/1	275	AUXILIARY LOCK-TYPICAL SECTIONS-ROCK EXCAVATION - LOCK WALL & LOCK FLOOR
OR41A.FP/2	276	AUXILIARY LOCK-TYPICAL SECTIONS-ROCK EXCAVATION - LOCK WALL & LOCK FLOOR
OR41A.FP/3	277	AUXILIARY LOCK-ROCK SECTIONS-UPPER & LOWER MITER SILLS & POIREE DAMS
RECONSTRUCTION L & D NO. 41		
OL-100.2/2	278	MAIN LOCK-GRADING & DRAINAGE PLAN
OL-100.2/3	279	GRADING DETAILS (SHEET 1)
OL-100.2/4	280	GRADING DETAILS (SHEET 2)
OL-100.2/15	281	MAIN LOCK-PLAN OF COFFERDAM
OL-120.1/1	282	CONEY ISLAND PAVING-PLAN AND DETAILS
OL120.1/2	283	CONEY ISLAND PAVING-PYLON DETAILS
OL-120.1/3	284	CONEY ISLAND PAVING-PAVING DETAILS
OL-120.1/4	285	MAIN LOCK ESPLANADE-PIPE TRENCH DETAILS
OL-120.1/5	286	MAIN LOCK ESPLANADE-STAIR DETAILS
OL-120.1/6	287	PAVING OF SLOPE BETWEEN MAIN & AUXILIARY LOCKS
OL132.1/1	288	NEW MOVABLE BRIDGE-GENERAL PLAN OF STRUCTURE
OL-132.1/2	289	NEW MOVABLE BRIDGE-SUBSTRUCTURE
OL-132.1/3	290	NEW MOVABLE BRIDGE-STRESS SHEET

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

OL-132.1/4	291	NEW MOVABLE BRIDGE-RACK SUPPORTS
OL-132.1/5	292	NEW MOVABLE BRIDGE-TRACK CASTINGS, SEGMENTAL CASTINGS AND TRACK GIRDERS
OL-132.1/6	293	NEW MOVABLE BRIDGE-BASCULE GIRDERS
OL-132.1/7	294	NEW MOVABLE BRIDGE-FLOOR BEAMS AND STRINGERS
OL-132.1/8	295	NEW MOVABLE BRIDGE-SEGMENTAL GIRDERS, TRUSSES AND PORTAL
OL-132.1/9	296	NEW MOVABLE BRIDGE-BRACING
OL-132.1/10	297	NEW MOVABLE BRIDGE-COUNTERWEIGHT SUPPORTS
OL-132.1/11	298	NEW MOVABLE BRIDGE-OPERATING MACHINERY
OL-132.1/12	299	NEW MOVABLE BRIDGE-MACHINERY SUPPORTS
OL-132.1/13	300	NEW MOVABLE BRIDGE-END LOCK AND BUFFER
OL-132.1/14	301	NEW MOVABLE BRIDGE-CONCRETE COUNTERWEIGHT
OL-132.1/15	302	NEW MOVABLE BRIDGE-WIRING DIAGRAM
OL-132.1/16	303	NEW MOVABLE BRIDGE-CONDUIT LAYOUT & MISC. DETAILS
OL-132.1/18	304	LIFT BRIDGE- NEW FLOOR DETAILS
OL-132.1/19	305	LIFT BRIDGE-WIRING DIAGRAM & CONDUIT LAYOUT
OL-200.1/1	306	MAIN LOCK-MONOLITH LAYOUT
OL-200.1/2	307	MAIN LOCK-GROUTING PLAN
OL-200.1/5	308	MAIN LOCK-LOWER GUARD WALL-MONOLITHS LG-1 THRU LG-7
OL-200.1/6	309	MAIN LOCK-LOWER GUARD WALL-MONOLITHS LG-8 THRU LG-14
OL-200.1/7	310	MAIN LOCK-LOWER GUARD WALL-MONOLITHS LG-15 THRU LG-21
OL-200.1/8	311	MAIN LOCK-LOWER GUARD WALL-MONOLITHS LG-22 THRU LG-28
OL-200.1/9	312	MAIN LOCK-LOWER GUARD WALL-SECTIONS & DETAILS
OL-200.1/10	313	LOCKS-PORT CLOSURES-PLANS & DETAILS
OL-200.1/11	314	LOCKS-PORT CLOSURES-ELEVATIONS, SECTIONS & DETAIL
OL-200.1/15	315	MAIN LOCK-NORTH WALL-MONOLITHS R23, 24, 25 & 26
OL-200.1/16	316	MAIN LOCK-NORTH WALL-MONOLITHS R27, 28, 29, 30 & 31
OL-200.1/17	317	MAIN LOCK-NORTH WALL-MONOLITHS R32, 33, 34, 35 & 36
OL-200.1/18	318	MAIN LOCK-NORTH WALL-MONOLITHS R37, 38, 39 & 40
OL-200.1/19	319	MAIN LOCK-NORTH WALL-MONOLITHS R41, 42 & 43
OL-200.1/20	320	MAIN LOCK-NORTH WALL-MONOLITHS R44, 45, 46, & 47
OL-200.1/21	321	MAIN LOCK-NORTH WALL-MONOLITHS R48, 49, 50 & 51
OL-200.1/22	322	MAIN LOCK-NORTH WALL-MONOLITHS R52, 53, 54
OL-200.1/23	323	MAIN LOCK-NORTH WALL-EMERGENCY GATE-MONOLITH NO. R55
OL-200.1/24	324	MAIN LOCK-NORTH WALL-MONOLITHS R56 THRU R61
OL-200.1/25	325	MAIN LOCK-NORTH WALL-MONOLITHS R62, R63, R64, R65 & R66
OL-200.1/26	326	MAIN LOCK-NORTH WALL-MONOLITHS R67 THRU R69
OL-200.1/30	327	MAIN LOCK-NORTH WALL-REINFORCEMENT DETAILS (SHEET NO. 1)
OL-200.1/31	328	MAIN LOCK-NORTH WALL-REINFORCEMENT DETAILS (SHEET NO. 2)
OL-200.1/32	329	MAIN LOCK-NORTH WALL-REINFORCEMENT DETAILS (SHEET NO. 3)
OL-200.1/33	330	MAIN LOCK-NORTH WALL-REINFORCEMENT DETAILS (SHEET NO. 4)

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

OL-200.1/34 NO. 5)	331	MAIN LOCK-NORTH WALL-REINFORCEMENT DETAILS (SHEET
OL-200.1/35 NO. 6)	332	MAIN LOCK-NORTH WALL-REINFORCEMENT DETAILS (SHEET
OL-200.1/36 NO. 7)	333	MAIN LOCK-NORTH WALL-REINFORCEMENT DETAILS (SHEET
OL-200.1/37 NO. 8)	334	MAIN LOCK-NORTH WALL-REINFORCEMENT DETAILS (SHEET
OL-200.1/38 NO. 9)	335	MAIN LOCK-NORTH WALL-REINFORCEMENT DETAILS (SHEET
OL-200.1/39 NO. 10)	336	MAIN LOCK-NORTH WALL-REINFORCEMENT DETAILS (SHEET
OL-200.1/40 NO. 11)	337	MAIN LOCK-NORTH WALL-REINFORCEMENT DETAILS (SHEET
OL 200.1/41 NO. 12)	338	MAIN LOCK-NORTH WALL-REINFORCEMENT DETAILS (SHEET
OL 200.1/42 NO. 13)	339	MAIN LOCK-NORTH WALL-REINFORCEMENT DETAILS (SHEET
OL-200.1/45 UG-10	340	MAIN LOCK-UPPER GUARD WALL-MONOLITHS UG-1 THRU
OL-200.1/46 UG-14	341	MAIN LOCK-UPPER GUARD WALL-MONOLITHS UG-11 THRU
OL-200.1/47	342	MAIN LOCK-UPPER GUARD WALL-SECTIONS & DETAILS
OL-200.1/50	343	MAIN LOCK-SOUTH WALL-MONOLITHS M1 & 2
OL-200.1/51	344	MAIN LOCK-SOUTH WALL-MONOLITHS M-3 THRU M-5
OL-200.1/52	345	MAIN LOCK-SOUTH WALL-MONOLITHS M6, M7, M8
OL-200.1/53 M13	346	MAIN LOCK-SOUTH WALL-MONOLITHS M9, M10, M11, M12,
OL-200.1/54	347	MAIN LOCK-SOUTH WALL-MONOLITHS M14, 15 & 16
OL-200.1/55	348	MAIN LOCK-SOUTH WALL-MONOLITHS M17 & M18 (SHEET 1)
OL-200.1/56	349	MAIN LOCK-SOUTH WALL-MONOLITHS M17 & M18 (SHEET 2)
OL-200.1/57	350	MAIN LOCK-SOUTH WALL-PUMP WELL MONOLITH M17
OL-200.1/58	351	MAIN LOCK-SOUTH WALL-MONOLITHS M19 & M20
OL-200.1/59 & M25	352	MAIN LOCK-SOUTH WALL-MONOLITHS M21, M22, M23, M24
OL-200.1/60 M29	353	MAIN LOCK-SOUTH WALL-MONOLITHS M26, M27, M28 AND
OL-200.1/61	354	MAIN LOCK-SOUTH WALL-MONOLITHS M30 & M31
OL-200.1/62 M32	355	MAIN LOCK-SOUTH WALL-EMERGENCY GATE-MONOLITH NO.
OL-200.1/63	356	MAIN LOCK-SOUTH WALL-MONOLITHS M33 THRU M35
OL-200.1/70 NO. 1)	357	MAIN LOCK-SOUTH WALL-REINFORCEMENT DETAILS (SHEET
OL-200.1/71 NO. 2)	358	MAIN LOCK-SOUTH WALL-REINFORCEMENT DETAILS (SHEET
OL-200.1/72 NO. 3)	359	MAIN LOCK-SOUTH WALL-REINFORCEMENT DETAILS (SHEET
OL-200.1/73 NO. 4)	360	MAIN LOCK-SOUTH WALL-REINFORCEMENT DETAILS (SHEET
OL-200.1/74 NO. 5)	361	MAIN LOCK-SOUTH WALL-REINFORCEMENT DETAILS (SHEET
OL-200.1/75 NO. 6)	362	MAIN LOCK-SOUTH WALL-REINFORCEMENT DETAILS (SHEET
OL-200.1/76	363	MAIN LOCK-SOUTH WALL-REINFORCEMENT DETAILS (SHEET

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

NO. 7)		
OL-200.1/77	364	MAIN LOCK-SOUTH WALL-REINFORCEMENT DETAILS (SHEET NO. 8)
OL-200.1/78	365	MAIN LOCK-SOUTH WALL-REINFORCEMENT DETAILS (SHEET NO. 9)
OL-200.1/79	366	MAIN LOCK-SOUTH WALL-REINFORCEMENT DETAILS (SHEET NO. 10)
OL-200.1/80	367	MAIN LOCK-SOUTH WALL-REINFORCEMENT DETAILS (SHEET NO. 11)
OL-200.1/81	368	MAIN LOCK-SOUTH WALL-REINFORCEMENT DETAILS (SHEET NO. 12)
OL-200.1/82	369	MAIN LOCK-SOUTH WALL-REINFORCEMENT DETAILS (SHEET NO. 13)
OL-200.1/83	370	MAIN LOCK-SOUTH WALL-REINFORCEMENT DETAILS (SHEET NO. 14)
OL-200.1/84	371	MAIN LOCK-EMERGENCY GATE RECESSES-REINFORCEMENT DETAILS
OL-200.1/85	372	MAIN LOCK-SILLS-PLANS & DETAILS
OL-200.1/86	373	MAIN LOCK-SILLS-SECTION & DETAILS
OL-200.1/88	374	MAIN LOCK-DRAIN HOLES IN MITER SILLS
OL-200.1/90	375	MAIN LOCK-FILLING & EMPTYING SYSTEM-PLAN & SECTIONS
OL-200.1/92	376	MAIN LOCK-FILLING & EMPTYING SYSTEM-CULVERT INTAKE MANIFOLD - SOUTH WALL
OL-200.1/93	377	MAIN LOCK-FILLING & EMPTYING SYSTEM - OUTLET STRUCTURES ( SHEET NO. 1)
OL-200.1/94	378	MAIN LOCK-FILLING & EMPTYING SYSTEM - OUTLET STRUCTURES ( SHEET NO. 2)
OL-200.1/95	379	MAIN LOCK-FILLING & EMPTYING SYSTEM - OUTLET STRUCTURES (SHEET NO. 3)
OL-200.1/101	380	MAIN LOCK-GALLERIES-LAYOUT PLAN
OL-200.1/102	381	MAIN LOCK-MISCELLANEOUS DETAILS-ELECTRICAL RISERS AND CROSSOVER
OL-200.1/103	382	MAIN LOCK-MISCELLANEOUS DETAILS-TUNNEL DETAILS
OL-200.1/104	383	MAIN LOCK-MISCELLANEOUS DETAILS-MITER GATE & MACHINERY RECESSES
OL-200.1/105	384	MAIN LOCK-MISCELLANEOUS DETAILS-CULVERT VALVES & MACHINERY RECESSES
OL-200.1/106	385	MAIN LOCK-MISCELLANEOUS DETAILS-CULVERT BULKHEAD RECESSES
OL-200.1/108	386	MAIN LOCK-MISCELLANEOUS DETAILS-MONOLITH JOINTS - DETAILS SOUTH WALL
OL-200.1/114	387	MAIN LOCK-MISCELLANEOUS METALS-WALL ARMOR LOCATION PLAN & ELEVATIONS (SHEET 1)
OL-200.1/116	387A	MAIN LOCK-MISCELLANEOUS METALS,WALL ARMOR & LINE HOOK DETAILS
OL-200.1/117	388	MAIN LOCK-MISCELLANEOUS METALS-WALL ARMOR DETAILS (SHEET 2)
OL-200.1/118	389	MAIN LOCK-MISCELLANEOUS METALS-WALL ARMOR DETAILS ( SHEET 3)
OL-200.1/119	389A	MAIN LOCK-MISCELLANEOUS METALS,LADDERS,CHECK POSTS & MONOLITH JOINT PROTECTION
OL-200.1/120	389B	MAIN LOCK-MISCELLANEOUS METALS,CORNER PROTECTION DETAILS AT RECESSES

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

OL-200.1/123	390	MAIN LOCK-MISCELLANEOUS METALS-INTAKE SCREENS-SOUTH WALL
OL-200.1/124	391	MAIN LOCK-EMERGENCY GATE TUNNEL-FIXED METAL LOCATIONS
OL-200.1/125	392	MAIN LOCK-MISCELLANEOUS METALS-EMERGENCY GATE RECESS - FIXED METALS & DETAILS
OL-200.1/126	393	MAIN LOCK-EMERGENCY GATE RECESS-FIXED METAL DETAILS
OL-200.1/127	394	MAIN LOCK-MISCELLANEOUS METALS-RECESS COVERS & RAILING PLANS (SHEET NO. 1)
OL-200.1/128	395	MAIN LOCK-MISCELLANEOUS METALS-RECESS COVERS & RAILING PLANS (SHEET NO. 2)
OL-200.1/129	396	MAIN LOCK-MISCELLANEOUS METALS-RECESS COVERS & RAILING PLANS (SHEET NO. 3)
OL-200.1/130	397	MAIN LOCK-MISCELLANEOUS METALS-RECESS COVERS & RAILING PLANS (SHEET NO. 4)
OL-200.1/131	398	MAIN LOCK-MISCELLANEOUS METALS-RECESS COVERS - DETAILS (SHEET 1)
OL-200.1/132	399	MAIN LOCK-MISCELLANEOUS METALS-RECESS COVERS - DETAILS (SHEET 2)
OL-200.1/133	400	MAIN LOCK-MISCELLANEOUS METALS-RECESS COVERS - DETAILS (SHEET 3)
OL-200.1/134	401	MAIN LOCK-MISCELLANEOUS METALS-GUARD CHAINS & GUARD RAILING
OL-200.1/135	402	MAIN LOCK-MISCELLANEOUS METALS-GUARD CHAIN DETAILS
OL-200.1/140	403	MAIN LOCK-CULVERT BULKHEAD RECESSES-EMBEDDED METAL
OL-200.1/141	404	MAIN LOCK-CULVERT BULKHEAD RECESSES-SEALING DIAPHRAGM
OL-200.2/1	405	INTERMEDIATE LOCK-WALL REPAIRS (SHEET 1)
OL-200.2/2	406	INTERMEDIATE LOCK-WALL REPAIRS (SHEET 2)
OL-200.2/3	407	INTERMEDIATE LOCK-WALL REPAIRS (SHEET 3)
OL-200.2/4	408	INTERMEDIATE LOCK-WALL REPAIRS (SHEET 4)
OL-200.2/5	409	INTERMEDIATE LOCK-WALL REPAIRS (SHEET 5)
OL-200.2/6	410	INTERMEDIATE LOCK-WALL REPAIRS (SHEET 6)
OL-200.2/7	411	INTERMEDIATE LOCK-WALL REPAIRS (SHEET 7)
OL-200.2/8	412	INTERMEDIATE LOCK-WALL REPAIRS (SHEET 8)
OL-200.2/11	413	INTERMEDIATE LOCK-ELEVATION SOUTH WALL
OL-200.2/11A	414	INTERMEDIATE LOCK-ALTERNATE DETAIL "A"
PNEUMATICALLY APPLIED MORTAR		
OL-200.2/12	415	WALL REPAIR-EDGE PROTECTION (SHEET 1)
OL-200.2/13	416	WALL REPAIR-EDGE PROTECTION (SHEET 2)
OL-200.2/14	417	INTERMEDIATE & AUXILIARY LOCKS-CULVERT & CROSSOVER REPAIRS
OL-200.2/16	418	INTERMEDIATE & AUXILIARY LOCKS-INTAKE SCREENS
OL-200.2/17	419	INTERMEDIATE LOCK-DETAILS OF CULVERT VENT
OL-200.2/18	420	INTERMEDIATE LOCK-EMERGENCY CLOSURE STORAGE AREA
OL-200.2/19	421	SOUTH CANAL WALL-MODIFICATION OF EXISTING WALL-PLAN
OL-200.2/20	422	SOUTH CANAL WALL-MODIFICATION OF EXISTING WALL - SECTIONS & DETAILS
OL-200.2/21	423	INTERMEDIATE & AUXILIARY LOCKS-MODIFICATION OF LOCK WALLS AT GUARD GATES

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

OL-200.2/21B	424	INTERMEDIATE LOCK-GUARD GATE MACHINERY RECESSES - REVISIONS TO COVER PLATES
OL-200.2/25	425	INTERMEDIATE LOCK-FLOATING MOORING BITT - GENERAL ARRANGEMENT & DETAILS
OL-200.2/26	426	INTERMEDIATE LOCK-FLOATING MOORING BITT-DETAILS
OL-200.2/27	427	INTERMEDIATE LOCK-FLOATING MOORING BITT-DETAILS
OL-200.2/27A	428	INTERMEDIATE LOCK-FLOATING MOORING BITT-PROTECTION
OL-200.2/28	429	INTERMEDIATE LOCK-FLOATING MOORING BITT-DETAILS
OL-210.1/3	430	MAIN LOCK-CULVERT-TRUNNION BEAM & DETAILS
OL-210.1/5	431	MAIN LOCK-CULVERT VALVE-EMBEDDED METAL
OL-210.1/7	432	MAIN LOCK-CULVERT VALVE-EXTENSION TO SIDE SEAL PLATES
OL-210.1/11	433	MAIN LOCK-CULVERT VALVE MACHINERY-ASSEMBLY
OL-210.1/17	434	MAIN LOCK-CULVERT VALVE MACHINERY-EMBEDDED METAL
OL-210.2/1	435	INTERMEDIATE LOCK-STONEY GATE VALVES-ASSEMBLY
OL-210.2/2	436	INTERMEDIATE LOCK-STONEY GATE VALVE-CYLINDER BASE RAISE
OL-210.2/3	437	INTERMEDIATE LOCK-STONEY GATE VALVE-CONTROL DETAILS
OL-210.2/4	438	INTERMEDIATE LOCK-STONEY GATE VALVE-SEAL DETAILS
OL-210.2/5	439	AUXILIARY LOCK-STONEY GATE VALVES-ASSEMBLY
OL-210.2/6	440	AUXILIARY LOCK-STONEY GATE VALVE-CYLINDER BASE RAISE
OL-210.2/7	441	AUXILIARY LOCK-STONEY GATE VALVE-CONTROL DETAILS
OL-210.2/8	442	AUXILIARY LOCK-STONEY GATE VALVE-SEAL DETAILS
OL-210.2/9	443	INTERMEDIATE & AUXILIARY LOCKS-STONEY GATE VALVE - MISCELLANEOUS DETAILS
OL-210.2/10	444	INTERMEDIATE & AUXILIARY LOCKS-STONEY GATE VALVE - ROLLER TRAIN ASSEMBLY & DETAILS
OL-210.2/11	445	INTERMEDIATE & AUXILIARY LOCKS-STONEY GATE 4-WAY VALVE - OPERATING LINKAGE DETAILS
OL-210.2/12	446	INTERMEDIATE & AUXILIARY LOCKS-STONEY GATE VALVE CONTROL LINKAGE - POSITION DIAGRAM
OL-210.2/13	447	INTERMEDIATE LOCK-STONEY GATE VALVE-MISCELLANEOUS REPAIRS
OL-220.1/1	448	MAIN LOCK-HYDRAULIC SYSTEM-SCHEMATIC PIPING DIAGRAM
OL-220.1/2	449	MAIN LOCK-HYDRAULIC SYSTEM-GENERAL PLAN
OL-220.1/3	450	MAIN LOCK-HYDRAULIC SYSTEM-PIPING DETAILS CONTROL STA. 2 & 2R & CYLINDER M2 & M2R
OL-220.1/4	451	MAIN LOCK-HYDRAULIC SYSTEM-PIPING DETAILS CYLINDER V2 & V2R AND MISCELLANEOUS SECTIONS
OL-220.1/5	452	MAIN LOCK-HYDRAULIC SYSTEM-PIPING DETAILS CONTROL STA. 1 & 1R, CYLINDER M1 & M1R AND PLAN MONO .32
OL-220.1/6	453	MAIN LOCK-HYDRAULIC SYSTEM-PIPING DETAILS CYLINDER V1 & V1R AND MISCELLANEOUS SECTIONS
OL-220.1/7	454	MAIN LOCK-HYDRAULIC SYSTEM-PIPING DETAILS MONO. NOS. M32, R55 & MISC. DETAILS
OL-220.1/8	455	MAIN LOCK-HYDRAULIC SYSTEM-OPERATING LEVERS & COVER PLATES
OL-220.1/9	456	MAIN LOCK- UTILITY PIPING SYSTEM-AIR & FUEL PIPING
OL-220.1/10	457	MAIN LOCK- UTILITY PIPING SYSTEM-WATER PIPING &

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

## MISCELLANEOUS DETAILS

OL-220.2/1	458	INTERMEDIATE & AUXILIARY LOCKS-HYDRAULIC SYSTEM - SCHEMATIC PIPING DIAGRAM
OL-220.2/2	459	INTERMEDIATE & AUXILIARY LOCKS-HYDRAULIC SYSTEM - CONTROL VALVE LINKAGE - SCHEMATIC DIAGRAMS
OL-220.2/3	460	INTERMEDIATE & AUXILIARY LOCKS-HYDRAULIC PIPING-ARRANGEMENT
OL-220.2/4	461	INTERMEDIATE LOCK-HYDRAULIC, WATER & AIR PIPING
OL-220.2/5	462	INTERMEDIATE LOCK-HYDRAULIC PIPING-SECTIONS
OL-220.2/6	463	INTERMEDIATE & AUXILIARY LOCKS-HYDRAULIC PIPING-CONNECTIONS TO EXISTING PIPING
OL-220.2/7	464	INTERMEDIATE & AUXILIARY LOCKS-HYDRAULIC PIPING AT AUXILIARY LOCK
OL-220.2/8	465	MAIN, INTERMEDIATE & AUXILIARY LOCKS-FIRE PROTECTION & AUXILIARY LOCKS AIR & WATER PIPING
OL-220.2/9	466	INTERMEDIATE & AUXILIARY LOCKS-AIR PIPING AT GUARD GATES
OL-220.2/10	467	MAIN, INTERMEDIATE & AUXILIARY LOCKS-FIRE PROTECTION DETAILS
OL-230.1/2	468	MAIN LOCK-MITER GATE-SECTION THRU LEAF AND RECESS
OL-230.1/14	468A	MAIN LOCK-MITER GATE-MITER GUIDE & UPPER LATCHING DEVICE
OL-230.1/18	469	MAIN LOCK-MITER GATE-FIXED METAL TOP ANCHORAGE ASSEMBLY
OL-230.1/20	470	MAIN LOCK-MITER GATE-FIXED METAL WALL QUOIN
OL-230.1/22	470A	MAIN LOCK-MITER GATE- LATCHES PLAN-SECTIONS & DETAILS
OL-230.2/1	471	INTERMEDIATE LOCK-LOWER MITER GATES-GENERAL LAYOUT OF GATE & RECESSES
OL-230.2/2	472	INTERMEDIATE LOCK-LOWER MITER GATES-GENERAL DRAWING
OL-230.2/3	473	INTERMEDIATE LOCK-LOWER MITER GATE-SUPPORTING GIRDERS
OL-230.2/4	474	INTERMEDIATE LOCK-LOWER MITER GATES-QUOIN & MITER POSTS
OL-230.2/5	475	INTERMEDIATE LOCK-LOWER MITER GATES-MITER GUIDE ASSEMBLY & WALKWAY
OL-230.2/6	476	INTERMEDIATE LOCK-LOWER MITER GATES-OPERATING STRUT
OL-230.2/7	477	INTERMEDIATE LOCK-LOWER MITER GATES-GATE LATCH & DETAILS
OL-230.2/8	478	INTERMEDIATE LOCK-LOWER MITER GATES-HEEL CASTING
OL-230.2/9	479	INTERMEDIATE LOCK-LOWER MITER GATES-FENDERS
OL-230.2/10	480	INTERMEDIATE LOCK-LOWER MITER GATES-PINTLE CASTING
OL-230.2/11	481	INTERMEDIATE LOCK-LOWER MITER GATES-MISCELLANEOUS DETAILS
OL-230.2/12	482	INTERMEDIATE LOCK-LOWER MITER GATES-MITER SILL
OL-230.2/13	483	INTERMEDIATE & AUXILIARY LOCKS-EMERGENCY CLOSURE SILLS
OL-230.2/14	484	INTERMEDIATE LOCK-EMERGENCY CLOSURE SUPPORT BEAMS
OL-230.2/15	485	INTERMEDIATE LOCK-EMERGENCY SUPPORT BEAM DETAILS
OL-230.2/16	486	INTERMEDIATE & AUXILIARY LOCKS-CLOSURE PANELS, BEAMS &

## GUIDE PICK-UP DEVICE



## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

OL-230.2/17	487	AUXILIARY LOCK-EMERGENCY CLOSURE SUPPORT BEAMS
OL-230.2/18	488	GUIDE EXTENSION FRAME, DRIVING WEIGHT & EMERGENCY BULKHEAD LIFTING DEVICE
OL-230.2/19	489	INTERMEDIATE AND AUXILIARY LOCKS-ASSEMBLY INSTRUCTIONS
		FOR LOCK EMERGENCY CLOSURES
OL-230.2/20	490	AUXILIARY LOCK-MODIFICATION OF GUARD GATE (SHEET 1)
OL-230.2/21	491	AUXILIARY LOCK-MODIFICATION OF GUARD GATE (SHEET 2)
OL-230.2/22	492	AUXILIARY LOCK-MODIFICATION OF GUARD GATE (SHEET 3)
OL-230.2/23	493	AUXILIARY LOCK-MODIFICATION OF GUARD GATE (SHEET 4)
OL-230.2/24	494	AUXILIARY LOCK-REPLACEMENT OF WOOD FENDERS LOWER GATE
OL-240.1/8	495	MAIN LOCK-MITER GATE MACHINERY-SECTOR BASE SUPPORT ANCHOR
OL-240.2/1	496	MODIFICATION TO EXISTING MITER GATE LINKAGE-ASSEMBLY
OL-240.2/2	497	PARTS FOR MODIFICATION OF EXISTING MITER GATE LINKAGE
OL-240.3/1	498	INTERMEDIATE LOCK-MITER GATE MACHINERY (SHEET 1)
OL-240.3/2	499	INTERMEDIATE LOCK-MITER GATE MACHINERY (SHEET 2)
OL-240.3/3	500	INTERMEDIATE LOCK-MITER GATE MACHINERY (SHEET 3)
OL-240.3/4	501	INTERMEDIATE LOCK-MITER GATE MACHINERY (SHEET 4)
OL-240.3/5	502	INTERMEDIATE LOCK-MITER GATE MACHINERY (SHEET 5)
OL-240.3/6	503	INTERMEDIATE & AUXILIARY LOCKS-MITER GATE MACHINERY (SHEET 6)
OL-240.3/7	504	AUXILIARY LOCK-MITER GATE MACHINERY (SHEET 7)
OL-240.3/8	505	AUXILIARY LOCK-MITER GATE MACHINERY (SHEET 8)
OL-240.3/9	506	AUXILIARY LOCK-MITER GATE MACHINERY (SHEET 9)
OL-240.3/10	507	AUXILIARY LOCK-MITER GATE MACHINERY (SHEET 10)
OL-240.3/11	508	AUXILIARY LOCK-GUARD GATE MACHINERY (SHEET 1)
OL-240.3/12	509	AUXILIARY LOCK-GUARD GATE MACHINERY (SHEET 2)
OL-240.3/13	510	AUXILIARY LOCK-GUARD GATE MACHINERY (SHEET 3)
OL-240.3/14	511	AUXILIARY LOCK-GUARD GATE MACHINERY (SHEET 4)
OL-240.3/15	512	INTERMEDIATE LOCK-GUARD GATE MACHINERY (SHEET 1)
OL-240.3/16	513	INTERMEDIATE LOCK-GUARD GATE MACHINERY (SHEET 2)
OL-240.3/17	514	INTERMEDIATE LOCK-GUARD GATE MACHINERY (SHEET 3)
OL-240.3/18	515	INTERMEDIATE LOCK-GUARD GATE MACHINERY (SHEET 4)
OL-250.1/1	516	MAIN LOCK-ELECTRICAL SYSTEM-GENERAL PLAN
OL-250.1/2	517	MAIN LOCK-ELECTRICAL SYSTEM-MAIN RACEWAY PLAN
OL-250.1/4	518	MAIN LOCK-ELECTRICAL SYSTEM-SECTIONS & DETAILS AND CONTROL STA. NO. 1
OL-250.1/8	519	MAIN LOCK-ELECTRICAL SYSTEM-ELECTRICAL CROSSOVER
OL-250.1/13	520	MAIN LOCK-ELECTRICAL SYSTEM-WIRING DIAGRAM-NORTH WALL
OL-420.1/11	521	OPERATIONS BUILDING-MECHANICAL EQUIPMENT-PLANS & SECTIONS
OL-420.1/15	522	OPERATIONS BUILDING-MECHANICAL EQUIPMENT-PIPING DIAGRAM

VOLUME 5

REFERENCE DRAWINGS

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

MCA100.1 X-1D COVER SHEET VOLUME 5

## COFFERDAM

## GENERAL

MCA100.2 X-0 COVER SHEET VOLUME 1  
 MCA100.2 X-1 INDEX SHEET 1 OF 3  
 MCA100.2 X-1A INDEX SHEET 2 OF 3  
 MCA100.2 X-1B INDEX SHEET 3 OF 3  
 MCA100.2 X-2 PICTORIAL VIEW OF PROJECT  
 MCA100.2 X-3 LOCATION PLAN AND VICINITY MAP  
 MCA100.2 X-4 LOCK GENERAL PLAN  
 MCA100.2 X-4A COFFERDAM GENERAL PLAN  
 MCA100.2 X-5 SURVEY CONTROL  
 MCA100.2 X-6 NOT USED  
 MCA100.2 X-7 NOT USED

## DEMOLITION

MCA480.1 C-1 DISPOSAL AREA AND OVERALL LOCATION PLAN  
 MCA480.1 C-2 U.S. GOVERNMENT PROPERTY LINE & WORK LIMITS SHEET 1  
 OF 4  
 MCA480.1 C-3 U.S. GOVERNMENT PROPERTY LINE & WORK LIMITS SHEET 2  
 OF 4  
 MCA480.1 C-4 U.S. GOVERNMENT PROPERTY LINE & WORK LIMITS SHEET 3  
 OF 4  
 MCA480.1 C-4A U.S. GOVERNMENT PROPERTY LINE & WORK LIMITS SHEET 4  
 OF 4  
 MCA480.1 C-5 STORAGE AREA SITE PLAN SHEET 1 OF 2  
 MCA480.1 C-6 STORAGE AREA SITE PLAN SHEET 2 OF 2  
 MCA480.1 C-7 DISPOSAL AREA SITE PLAN SHEET 1 OF 3  
 MCA480.1 C-7A DISPOSAL AREA SITE PLAN SHEET 2 OF 3  
 MCA480.1 C-7B DISPOSAL AREA SITE PLAN SHEET 3 OF 3  
 MCA480.1 C-8 INITIAL DEMOLITION FOR HISTORICAL MITIGATION  
 MCA480.1 C-9 OVERALL DEMOLITION PLAN  
 MCA480.1 C-10 DEMOLITION PLAN SHEET 1 OF 4  
 MCA480.1 C-11 DEMOLITION PLAN SHEET 2 OF 4  
 MCA480.1 C-11A DEMOLITION PLAN (PHOTOGRAPH) SHEET 3 OF 4  
 MCA480.1 C-12 DEMOLITION PLAN SHEET 4 OF 4  
 MCA480.1 M-1 OVERALL MECHANICAL DEMOLITION PLAN  
 MCA480.1 M-2 MECHANICAL DEMOLITION SHEET 1 OF 2  
 MCA480.1 M-3 MECHANICAL DEMOLITION SHEET 2 OF 2  
 MCA480.1 M-3A OVERALL LOCK MECHANICAL DEMOLITION PLAN  
 MCA480.1 M-3B LOCK DEMOLITION PHOTOGRAPHS SHEET 1 OF 4  
 MCA480.1 M-3C LOCK DEMOLITION PHOTOGRAPHS SHEET 2 OF 4  
 MCA480.1 M-3D LOCK DEMOLITION PHOTOGRAPHS SHEET 3 OF 4  
 MCA480.1 M-3E LOCK DEMOLITION PHOTOGRAPHS SHEET 4 OF 4

## SITE INFORMATION

MCA130.1 C-13 OVERALL COFFERDAM SITE PLAN  
 MCA130.1 C-14 COFFERDAM SITE PLAN SHEET 1 OF 2

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

MCA130.1	C-15	COFFERDAM SITE PLAN SHEET 2 OF 2
MCA130.1	C-16	TOP OF ROCK MAP
MCA130.1	C-17	COFFERDAM PREDREDGING PLAN SHEET 1 OF 2
MCA130.1	C-18	COFFERDAM PREDREDGING PLAN SHEET 2 OF 2
MCA130.1	C-19	OVERALL COFFERDAM GRADING AND DRAINAGE PLAN
MCA130.1	C-20	COFFERDAM GRADING AND DRAINAGE PLAN SHEET 1 OF 3
MCA130.1	C-21	COFFERDAM GRADING AND DRAINAGE PLAN SHEET 2 OF 3
MCA130.1	C-22	COFFERDAM GRADING AND DRAINAGE PLAN SHEET 3 OF 3
MCA130.1	C-22A	COFFERDAM EMERGENCY EXITS
MCA130.1	C-23	NOT USED
MCA130.1	C-24	DISPOSAL AREA GRADING PLAN
MCA130.1	C-25	OVERALL EROSION CONTROL PLAN
MCA130.1	C-26	EROSION CONTROL PLAN SHEET 1 OF 4
MCA130.1	C-27	EROSION CONTROL PLAN SHEET 2 OF 4
MCA130.1	C-28	EROSION CONTROL PLAN SHEET 3 OF 4
MCA130.1	C-29	EROSION CONTROL PLAN SHEET 4 OF 4
MCA130.1	C-30	EROSION CONTROL DETAILS
MCA130.1	C-31	NOT USED
MCA130.1	C-32	NOT USED
MCA130.1	C-32A	NOT USED
MCA130.1	C-32B	NOT USED
MCA130.1	C-33	FENCE DETAILS
MCA130.1	C-34	OVERALL PLAN CENTERLINE STATIONING
MCA130.1	C-35	CENTERLINE STATIONING (SHEET 1 OF 3)
MCA130.1	C-36	CENTERLINE STATIONING (SHEET 2 OF 3)
MCA130.1	C-37	CENTERLINE STATIONING (SHEET 3 OF 3)
MCA130.1	C-38	CROSS SECTION STATION 15+00
MCA130.1	C-39	CROSS SECTION STATION 17+00
MCA130.1	C-40	CROSS SECTION STATION 18+25
MCA130.1	C-41	CROSS SECTION STATION 20+00
MCA130.1	C-42	CROSS SECTION STATION 21+50
MCA130.1	C-43	CROSS SECTION STATION 23+00
MCA130.1	C-44	CROSS SECTION STATION 25+00
MCA130.1	C-45	CROSS SECTION STATION 26+70
MCA130.1	C-46	CROSS SECTION STATION 30+00
MCA130.1	C-47	CROSS SECTION STATION 31+50
MCA130.1	C-48	CROSS SECTION STATION 32+70
MCA130.1	C-49	CROSS SECTION STATION 33+50

## HISTORICAL MITIGATION

MCA140.1	C-50	SITE PLAN
MCA140.1	C-51	GRADING AND DRAINAGE PLAN SHEET 1 OF 2
MCA140.1	C-51A	GRADING AND DRAINAGE PLAN SHEET 2 OF 2
MCA140.1	C-52	TYPICAL SECTIONS AND DETAILS
MCA140.1	C-53	STORM DRAIN PROFILES AND PIPE SECTIONS
MCA140.1	C-54	CULVERT PLAN
MCA140.1	C-55	CULVERT JUNCTION
MCA140.1	C-56	CULVERT DETAILS
MCA140.1	A-1	ENLARGED PLANS / ELEVATIONS
MCA140.1	A-2	ARCHITECTURAL SITE PLAN & DETAILS
MCA140.1	A-3	ELEVATIONS
MCA140.1	A-4	SECTIONS
MCA140.1	A-5	PLAN, SECTIONS & ELEVATION

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

MCA140.1	A-6	DETAILS
MCA140.1	A-7	MISCELLANEOUS DETAILS
MCA140.1	S-1	GENERAL STRUCTURAL NOTES & DETAILS
MCA140.1	S-1A	GENERAL STRUCTURAL DETAILS
MCA140.1	E-1	ELECTRICAL DEMOLITION PLAN
MCA140.1	E-2	ELECTRICAL PLAN
MCA140.1	E-3	ELECTRICAL DETAILS
MCA140.1	E-4	ELECTRICAL DETAILS

## MECHANICAL

MCA150.2	M-4	OVERALL MECHANICAL SITE PLAN
MCA150.2	M-5	MECHANICAL SITE PLAN SHEET 1 OF 4
MCA150.2	M-6	MECHANICAL SITE PLAN SHEET 2 OF 4
MCA150.2	M-7	MECHANICAL SITE PLAN SHEET 3 OF 4
MCA150.2	M-8	MECHANICAL SITE PLAN SHEET 4 OF 4
MCA150.2	M-8A	MECHANICAL SITE PLAN SHEET 4A OF 4
MCA150.2	M-9	WATERLINE PROFILE "A"
MCA150.2	M-10	WATERLINE PROFILE "B"
MCA150.2	M-10A	WATERLINE PROFILES "C & D"
MCA150.2	M-11	UTILITY DETAILS
MCA150.2	M-12	SEISMIC UTILITY DETAILS

## ELECTRICAL

MCA150.2	E-5	ELECTRICAL SITE PLAN (SHEET 1 OF 2)
MCA150.2	E-6	ELECTRICAL SITE PLAN (SHEET 2 OF 2)

## STRUCTURAL

MCA470.1	S-2	COFFERDAM LAYOUT UPSTREAM CELLS
MCA470.1	S-2A	360 FOOT LOCK UPSTREAM NOSE TIE-IN
MCA470.1	S-3	COFFERDAM LAYOUT DOWNSTREAM CELLS
MCA470.1	S-4	COFFERDAM PROFILE
MCA470.1	S-5	COFFERDAM DETAILS
MCA470.1	S-6	COFFERDAM DETAILS
MCA470.1	S-7	COFFERDAM DETAILS
MCA470.1	S-8	COFFERDAM DETAILS
MCA470.1	S-9	NOT USED
MCA470.1	S-10	FLOOD GATE PLAN, ELEVATION & DETAILS
MCA470.1	S-11	FLOOD GATE DETAILS
MCA470.1	S-12	BINWALL DETAILS SHEET 1
MCA470.1	S-13	BINWALL DETAILS SHEET 2
MCA470.1	S-14	DEWATERING PLAN SHEET 1 OF 2
MCA470.1	S-15	DEWATERING PLAN SHEET 2 OF 2
MCA470.1	S-16	DEWATERING DETAILS
MCA470.1	S-17	COFFERDAM INSTRUMENTATION SHEET 1 OF 2
MCA470.1	S-18	COFFERDAM INSTRUMENTATION SHEET 2 OF 2
MCA470.1	S-19	INSTRUMENTATION DETAILS
MCA470.1	S-20	600' SOUTH WALL ANCHORAGE PLANS AND SECTIONS STA.
33+36.41 TO 30+87.05		
MCA470.1	S-21	600' SOUTH WALL ANCHORAGE PLANS AND SECTIONS STA.
30+87.05 TO 28+17.09		
MCA470.1	S-22	600' SOUTH WALL ANCHORAGE PLANS AND SECTIONS STA.

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

28+17.09 TO 25+81.41		
MCA470.1	S-23	600' SOUTH WALL ANCHORAGE PLANS AND SECTIONS STA.
25+18.41 TO 22+61.60		
MCA470.1	S-24	600' SOUTH WALL ANCHORAGE PLANS AND SECTIONS STA.
22+61.60 TO 20+22.26		
MCA470.1	S-25	600' SOUTH WALL ANCHORAGE PLANS AND SECTIONS STA.
20+22.26 TO 17+20.66		
MCA470.1	S-26	600' SOUTH WALL ANCHORAGE PLANS AND SECTIONS STA.
17+20.66 TO 13+69.40		
MCA470.1	S-27	600' LOCK-ANCHORAGE LOAD TRANSFER SYSTEM
MCA470.1	S-28	600' LOCK SOUTH WALL - ANCHOR POCKET LOCATIONS
MCA470.1	S-29	600' LOCK SOUTH WALL - ANCHOR POCKET LOCATIONS
MCA470.1	S-30	ANCHORAGE PLANS AND SECTIONS - 1200' SOUTH WALL
STA. 33+90 TO 30+68		
MCA470.1	S-31	ANCHORAGE PLANS AND SECTIONS - 1200' SOUTH WALL
STA. 30+68 TO 26+85		
MCA470.1	S-32	1200' LOCK ANCHORAGE - LOAD TRANSFER SYSTEM
MCA470.1	S-33	1200' LOCK SOUTH WALL - ANCHOR POCKET LOCATIONS
MCA470.1	S-34	STABILIZATION OF M31 & M32
MCA470.1	S-35	STABILIZATION OF M31 & M32
MCA470.1	S-36	NOT USED
MCA470.1	S-37	CRACK REPAIRS-M7 & M8-PLAN & ELEVATION
MCA470.1	S-37A	CRACK REPAIRS-M13-PLAN & ELEVATION
MCA470.1	S-38	CRACK REPAIRS-M14 & M15-PLAN & ELEVATION
MCA470.1	S-39	STABILIZATION OF 360' LOCK NORTH WALL
MCA470.1	S-39A	STABILIZATION OF 360' LOCK NORTH WALL
MCA470.1	S-40	SWING BRIDGE - PLAN AND ELEVATION
MCA470.1	S-41	PROTECTIVE SURFACE - SWING BRIDGE CENTER PIER
MCA470.1	S-42	STABILIZATION OF SWING BRIDGE NORTH ABUTMENT
MCA470.1	S-43	PROTECTIVE SURFACE - SWING BRIDGE SOUTH ABUTMENT
MCA470.1	S-44	BUTTRESS PLAN 1200' LOCK SOUTH WALL
MCA470.1	S-45	BUTTRESS & MONOLITH CROSS SECTIONS
MCA470.1	S-46	BUTTRESS REINFORCING
MCA470.1	S-47	MONOLITH BUTTRESS SECTIONS AND DETAILS

## McALPINE SUPPORT FACILITIES

OL400.5	U1-1	UTILITY PLAN (SHEET 1 OF 2)
OL400.5	U1-2	UTILITY PLAN (SHEET 2 OF 2)
OL400.5	E1-2	ELECTRICAL SCHEDULES & DETAILS

## OLMSTED LOCKS AND DAM

OLM100.1	X-6	GENERAL PLAN
OLM100.1	X-22	PLAN KENTUCKY CELLS
OLM100.1	X-22A	SALVAGE MATERIALS STORAGE PLAN AT KENTUCKY BANK
LOCATION		
OLM500.1	H-1	HYDROGRAPHS 1966 TO 1969
OLM500.1	H-2	HYDROGRAPHS 1969 TO 1973
OLM500.1	H-3	HYDROGRAPHS 1974 TO 1977
OLM500.1	H-4	HYDROGRAPHS 1978 TO 1981
OLM500.1	H-5	HYDROGRAPHS 1982 TO 1985
OLM500.1	H-6	HYDROGRAPHS 1986 TO 1989
OLM500.1	H-7	HYDROGRAPHS 1990 TO 1993

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

OLM500.1	H-8	HYDROGRAPHS 1994 TO 1997
OLM500.1	H-9	HYDROGRAPHS 1998 TO 2000

## 1.8 AS-BUILT DOCUMENTS

3 November 1998 (Version 1)

## 1.8.1 General.

This section covers the completion of as-built drawings and as-built specifications, as a requirement of the contract.

## 1.8.1.1 As-Built Drawings

An as-built drawing is a construction drawing revised to reflect the final as-built conditions of the project as a result of modifications, changes, corrections to the project design required during construction, submittals and extensions of design. The terms "drawings," "contract drawings," "drawing files," "working as-built drawings" and "final as-built drawings" refer to contract drawings which are revised to be used for the "RECORD DRAWING AS-BUILTS".

## 1.8.1.2 As-Built Specifications

As-built specifications are the construction specifications as modified by changes (contract mods, ACO approved variations from the construction specifications and drawings, to include field adjustments necessary in the performance of the work).

## 1.8.2 Maintenance of Working As-Built Drawings and Specifications

The Contractor shall revise 2 sets of paper prints of drawings and specifications by red-line process to show the as-built conditions during the prosecution of the project. These as-built marked prints shall be kept current on a weekly basis and available on the jobsite at all times. Changes from the contract plans which are made in the work or additional information which might be uncovered in the course of construction shall be accurately and neatly recorded as they occur by means of details and notes. Changes must be reflected on all sheets affected by the change. The working as-built marked prints will be jointly reviewed for accuracy and completeness by the Contracting Officer and the Contractor prior to submission of each monthly pay estimate. These monthly meetings shall be included in the Project Schedule, which is prepared in accordance with Section 01320 PROJECT SCHEDULE. The working as-built drawings and specifications shall show the following information, but not be limited thereto:

a. The actual location, kinds and sizes of all sub-surface utility lines. In order that the location of these lines and appurtenances may be determined in the event the surface openings or indicators become covered over or obscured, the as-built drawings shall show, by offset dimensions to two permanently fixed surface features, the end of each run including each

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

change in direction. Valves, splice boxes and similar appurtenances shall be located by dimensioning along the utility run from a reference point. The average depth below the surface of each run shall also be recorded.

b. The location and dimensions of any changes within the building structure.

c. Correct grade, elevations, cross section, or alignment of roads, earthwork, structures or utilities if any changes were made from contract plans.

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d. Additional as-built information that exceeds the detail shown on the Contract Drawings. These as-built conditions include those that reflect structural details, fabrication, erection, installation plans and placing details, reinforcing steel drawings, concrete lift drawings, pipe sizes, insulation material, dimensions of equipment foundations and layouts, equipment, sizes, mechanical room layouts and other extensions of design, that were not shown in the original contract documents because the exact details were not known until after the time of approved shop drawings. **Submittals identified as type SD-04 Drawings shall be revised to show as-built conditions, and will serve as the as-built record without actual incorporation into the contract drawings. All such submittals must include, along with the hard copy of the drawings, CADD files of the drawings in a commercially available digital format, compatible with the Using Agency System (see paragraph 1.8.11).**

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e. The topography, invert elevations and grades of drainage installed or affected as part of the project construction.

f. Changes or modifications which result from the final inspection.

g. Where contract drawings or specifications present options, only the option selected for construction shall be shown on the final as-built prints.

h. If borrow material for this project is from sources on Government property, or if Government property is used as a spoil area, the Contractor shall furnish a contour map of the final borrow pit/spoil area elevations.

g. If fire protection and fire detection related systems are included in this project, the as-built drawings will include detailed information for all aspects of the systems including wiring, piping, and equipment drawings.

The Contractor will be provided files at the beginning of construction for use during the construction phase which are to be maintained during construction and for the preparation of as-builts. The Contractor shall enter changes and corrections on blue line prints on a weekly basis in accordance with Paragraph "Maintenance of Working As-Built Drawings and Specifications" and update the CADD as-built drawings and electronic specification files on a weekly basis. Both paper and electronic documents shall be available at all times and shall be provided promptly to the Contracting Officer when requested, but not less than monthly. The Contractor shall be responsible for backup of electronic files during

construction and for controlling release of information.

#### 1.8.3 Retainage

The Contractor shall include in his schedule of values, the cost of as-built document preparation. This value shall include all requirements of this clause:

- Maintenance of working as-built drawings
- Maintenance of working as-built specifications
- Conversion of submittals and other miscellaneous documents into electronic files
- Creation of "Record As-Built Drawings & Specifications" (by CADD dwgs and SpecsIntact specifications as specified herein.)
- Creation of a CD containing all required files.
- Submittal of as-built documents in the required media forms and numbers of copies

Although no separate payment will be made for as-built document preparation (reference paragraph 1.8.12), the Contractor will be required to include this work in his schedule of values for the purpose of retainage. If the Contractor fails to maintain the working as-built drawings and specifications as specified herein, the Contracting Officer will deduct from the monthly progress payment an amount representing the estimated cost of bringing the as-built documents up to date. This monthly deduction will continue until an agreement can be reached between the Contracting Officer and the Contractor regarding the accuracy and completeness of working as-built documents.

#### 1.8.4 Preliminary Submittal

Six (6) weeks prior to occupancy of this facility by the Government, the Contractor shall submit one (1) set of the original working as-built documents to the Contracting Officer for review and approval. These working as-built marked drawings and specifications shall be neat, legible and accurate. The review by Government personnel will be expedited to the maximum extent possible. Upon approval, the working as-built marked documents will be returned to the Contractor for use in preparation of final as-built documents. If upon review, the working as-built marked documents are found to contain errors and/or omissions, they will be returned to the Contractor for corrections. The Contractor shall complete the corrections and return the working as-built marked documents to the Contracting Officer within 10 calendar days.

#### 1.8.5 Preparation of Final As-Built Drawings and Specifications

Upon approval of the working as-built prints submittal, the Contractor will be furnished, by the Government, one set of contract drawings in CADD and one set of electronic specification files (if not previously provided) with all amendments incorporated, to be used for final as-built drawings. Any contract modifications which were developed by revision of contract drawing CADD files or electronic specification files, will already have the



## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

modifications reflected in the files provided to the Contractor. The contract documents will be furnished in the formats specified in paragraphs 1.8.7 and 1.8.11. The drawings shall be modified as may be necessary to correctly show the features of the project as it has been constructed by bringing the contract set into agreement with approved working as-built prints, adding such additional drawings as may be necessary. These documents are part of the permanent records of this project and the Contractor shall be responsible for the protection and safety thereof until returned to the Contracting Officer. Any documents damaged or lost by the Contractor shall be satisfactorily replaced by the Contractor at no expense to the Government.

In the event the Contractor accomplishes additional work which changes the as-built conditions of the facility, after submission and approval of the working as-built documents, he shall be responsible for the addition of these changes to the working as-built documents and also to the final as-built documents.

#### 1.8.6 Markings and Indicators

Changes shall be annotated with a triangle and sequential number at the following locations:

- a. bottom of the revised detail
- b. right hand and bottom border aligned with the revised detail
- c. the revision block of the title block.

Separate markings shall be made for each modification negotiated into the contract.

#### 1.8.7 Preparation of Final As-Built Specifications

Final as-built specifications shall be prepared in Specsintact and the electronic files shall be placed on the same CD ROM that contains the "As-Built" CADD files, if applicable. The front sheet of the specifications shall contain an identification which clearly labels the specifications as representing as-built conditions and shall be dated with the date of the submittal.

#### 1.8.8 Preparation of Other As-Built Documents

All other non-electronic documents which may include design analysis, catalog cuts, certification documents that are not available in native electronic format shall be scanned and provided in an organized manner in Adobe .pdf format.

#### 1.8.9 Submittal of Final As-Built Documents

At the time of Beneficial Occupancy of the project, Final As-Built documents shall be provided to the Contracting Officer in the formats described in paragraphs 1.8.7 and 1.8.11 .

#### 1.8.10 Partial Occupancy

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

For projects where portions of construction are to be occupied or activated prior to overall project completion, including portions of utility systems, as-built drawings for those portions of the facility being occupied or activated shall be supplied at the time the facility is occupied or activated. This same as-built information previously furnished must also be shown on the final set of as-built drawings at project completion.

## 1.8.11 Computer Aided Design and Drafting (CADD) Drawings

**\*1**

Only personnel proficient in the preparation of CADD drawings shall be employed to modify the contract drawings or prepare additional new drawings. The Contractor CADD technician(s) responsible for the preparation of the As-built drawings shall be located at the project site. The Contractor CADD technician(s) shall have a minimum of one year experience not including school or 18 months schooling on Microstation CADD software system. The qualifications of the Contractor CADD technician(s) shall be submitted to the Contracting Officer for approval. Additions and corrections to the contract drawings shall be equal in quality to that of the originals. Line work, line weights, lettering, layering conventions, and symbols shall be the same as the original line work, line weights, lettering, layering conventions, and symbols. If additional drawings are required, they shall be prepared using the specified electronic file format applying the same guidance specified for original drawings. Three dimensional (3D) elements shall be placed in files in their proper locations when utilizing 3D files with spatially correct elements. The title block and drawing border to be used for any new final as-built drawings shall be identical to that used on the contract drawings. Additions and corrections to the contract drawings shall be accomplished using CADD media files supplied by the Government. All work by the Contractor shall be done on files in the format in which they are provided. Translation of files to a different format, for the purpose of As-Built production, and then retranslating back to the format originally provided, will not be acceptable. These contract drawings will already be compatible with the Using Agency's system when received by the Contractor. The Using Agency uses Microstation **Version 7** CADD software system. The media files shall be supplied by the Contractor to the COR on ISO 9660 Format CD-ROM. The Contractor shall be responsible for providing all program files and hardware necessary to prepare final as-built drawings. The Contracting Officer will review final as-built drawings for accuracy and the Contractor shall make all required corrections, changes, additions, and deletions.

**\*1**

a. When final revisions have been completed, the cover sheet drawing shall show the wording "RECORD DRAWING AS-BUILT" followed by the name of the Contractor in letters at least 3/16 inch high. All other contract drawings shall be marked either "AS-BUILT" drawing denoting no revisions on the sheet or "REVISED AS-BUILT" denoting one or more revisions. Original contract drawings shall be dated in the revision block.

b. Revision markers defined in paragraph 1.8.6 shall be placed as follows:

- (1) at the detail, placed in the design file where the revised graphics are located and the revision was placed
- (2) right hand and bottom border in the drawing sheet file

revision block of the title block in the drawing sheet file.

c. After receipt by the Contractor of the approved working as-built prints and the original contract drawings files the Contractor shall, within 30 calendar days, make the final as-built submittal. This submittal shall consist of 2 sets of completed final as-built drawings on separate media consisting of both CADD files (compatible with the Using Agency's system on electronic storage media identical to that supplied by the Government) and mylars; 2 blue line prints of these drawings and the return of the approved marked working as-built prints. They shall be complete in all details and identical in form and function to the contract drawing files supplied by the Government. Any transactions or adjustments necessary to accomplish this is the responsibility of the Contractor. The Government reserves the right to reject any drawing files it deems incompatible with its CADD system. All paper prints, drawing files and storage media submitted will become the property of the Government upon final approval. Failure to submit final as-built drawing files and marked prints as specified shall be cause for withholding any payment due the Contractor under this contract. Approval and acceptance of final as-built drawings shall be accomplished before final payment is made to the Contractor.

#### 1.8.12 Payment

No separate payment will be made for as-built drawings required under this contract, and all costs in conjunction therewith, shall be considered a subsidiary obligation of the Contractor.

#### 1.9 NOT USED (AS-BUILT DOCUMENTS FOR DESIGN BUILD PROJECTS)

#### 1.10 EQUIPMENT DATA

15 June 1990

Real Property Equipment. Contractor shall be required to make an Equipment-in-Place list of all installed equipment furnished under this contract. This list shall include all information usually listed on manufacturer's name plate. The form is part of SPECIAL CONTRACT REQUIREMENTS and is included following the SPECIAL CONTRACT REQUIREMENTS, so to positively identify the piece of property. The list shall also include the cost of each piece of installed property F.O.B. construction site. For each of the items which is specified herein to be guaranteed for a specified period from the date of acceptance thereof, the following information shall be given: The name, serial and model number address of equipment supplier, or manufacturer originating the guaranteed item. The Contractor's guarantee to the Government of these items will not be limited by the terms of any manufacturer's guarantee to the Contractor. The list shall be furnished as one (1) reproducible and three (3) copies and shall be furnished to the Contracting Officer not later than thirty (30) calendar days prior to completion of any segment of the contract work which has an incremental completion date.

Maintenance and Parts Data. The Contractor will be required to furnish a brochure, catalog cut, parts list, manufacturer's data sheet or other publication which will show detailed parts data on all other equipment

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

subject to repair and maintenance procedures not otherwise required in Operations and Maintenance Manuals specified elsewhere in this contract. Distribution of directives shall follow the same requirements as listed in paragraph above.

## 1.11 PHYSICAL DATA (APR 1984) FAR 52.236-4.

2 January 1996

Data and information furnished or referred to below are furnished for the Contractor's information. The Government will not be responsible for any interpretation or conclusion drawn from the data or information by the Contractor.

a. Physical Conditions indicated on the drawings and in the specifications are the result of site investigations by surveys, borings, test pits and probings. Cores and soil samples from results of site investigations are available for inspection at various locations in the Louisville area, subject to prior arrangement at the Office of the District Engineer, Engineering Division, Steve Durrett, 600 Dr. Martin Luther King, Jr. Place, Louisville, Kentucky 40201, (502) 315-6370.

b. Weather Conditions. The Contractor shall make his own investigations as to weather conditions at the site. Data may be obtained from various National Weather Service offices located generally at airports of principal cities, the nearest to this project being:

Louisville, KY WSFO  
NWS Forecast Office, NOAA  
6201 Therlery Ln.  
Louisville, KY 40229  
502-968-6025

Historical data for all areas may be obtained from:

U. S. Department of Commerce  
National Climatic Center  
Federal Building  
Asheville, N. C. 28801

\*1

c. Transportation Facilities. Roads and railroads in the general area are shown on the drawings. Access ways shall be investigated by the Contractor to satisfy himself as to their existence and allowable use. **Access roads into the existing cofferdam constructed by the Cofferdam Contractor may be available for use in this contract.** The Contractor shall not use the road or the parking area of the Resident Engineer's Office. The Contractor will be held responsible for any and all damages attributable to the actions of the Contractor, his subcontractors, and his suppliers outside the limits of construction shown on the drawings or designated by the Contracting Officer. This shall include damage to existing roads, drainage structures, electric or telephone facilities, pavement and other structures and facilities. All such damage shall be repaired to the satisfaction of the proper municipal or state authorities by the Contractor and at his expense.

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d. All hauling over roads to and from the project will be subject to the

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

approval of the proper municipal or state authorities, and the Contractor shall make the necessary arrangements, at his expense, with such authorities for the use of such roads and shall comply with their requirements in connection with such use.

e. All access roads and haul roads, whether built under this contract or not, shall be made available at no cost to Government forces, LG&E personnel, and other Government contractors working in the vicinity. The project roads at the McAlpine site shall not be closed. In particular, availability of access to Shippingport Island, the LG&E Hydropower Plant, the Government Offices, the private business located at 27th and Marine Streets, and the riverwalk shall be maintained at all times. Vehicle speed shall be as posted or slower if directed. The Government shall suspend or restrict usage of project roads at any time the requirements specified are not met or if it is in the best interests of the Government.

f. The steel bascule bridge that crosses the existing McAlpine 1200-foot lock has a vertical clearance of 15 feet and a horizontal clearance of 16 feet. The bridge is raised an average of 20 times per day to allow for operation of the 1200-foot lock, and remains inaccessible to vehicular and pedestrian traffic an average of 10 to 15 minutes each time it is raised.

g. The steel swing bridge that crosses the McAlpine 600-foot lock has a vertical clearance of approximately 21 feet and a horizontal clearance of 15 feet, 4 inches. The swing bridge will not be swung for construction purposes except on a very limited basis as necessary for the execution of work as determined and approved by the Contracting Officer. A request shall be made to the Resident Engineer at least 48 hours prior to the need to swing the bridge and shall be scheduled such that intermittent access to the island (not less than hourly) can be accommodated. Operation of the swing bridge will not be possible once construction activities have progressed to the point of impeding its rotation.

h. The bascule bridge crossing the existing 1200-foot lock and the swing bridge crossing the 600-foot lock are subject to the following weight restrictions: For 3-axle vehicles configured similar to AASHTO HS-20, the bridges are restricted to a gross vehicle weight of 36 tons. For 2-axle vehicles configured similar to AASHTO H-20, they are restricted to a gross vehicle weight of 25 tons. The maximum axle load for any vehicle on the bridges is 20 tons.

i. The new access bridge crossing the new and existing 1200-foot locks will be subject to the following weight restrictions when it is complete: For 3-axle vehicles configured similar to AASHTO HS-20, the bridge is restricted to a gross vehicle weight of 36 tons. For 2-axle vehicles configured similar to AASHTO H-20, it is restricted to a gross vehicle weight of 25 tons.

j. Once every two years the bascule bridge crossing the existing 1200-foot lock and the swing bridge crossing the 600-foot lock will be inspected. The first inspection of the bascule bridge will occur in the summer of 2004. The first inspection of the swing bridge will occur in the summer of 2003. Each inspection of the bascule bridge will last approximately 2 days. Each inspection of the swing bridge will last approximately 21 days.

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

During these inspections, the bridges will be closed for approximately one hour during each shift.

k. During flooding periods, closures are installed in the levee at 26th street and 27th street. The closure in the levee at 26th street is installed when the Ohio River upper pool reaches elevation 456.0 (48 feet on the upper gauge). The closure in the levee at 27th street is installed when the Ohio River upper pool reaches elevation 436.7 (16.7 feet on the upper gauge).

l. The Contractor will not be permitted to place any equipment or materials on the south wall of the 1200-foot lock wall, except for those equipment and materials necessary to detension the anchors in this wall. The Contractor may not have access to the 1200-foot lock wall without the approval of the Contracting Officer. The Contractor will not be permitted to stockpile materials on the cofferdam cells, the south wall of the 600-foot lock, the flat area behind the south wall of the 600-foot lock, or within 50 feet of the crest of the slope on the south bank. No construction loading will be permitted on the wall or the flat area behind the wall, other than normal vehicular traffic that can travel on a highway without a permit, unless approved by the Contracting Officer.

m. The Contractor shall take the necessary precautions to preserve the cutoff wall on the surge basin dike, as shown on Contract Drawing C-13.

n. Any item of Government property encountered by the Contractor that must be temporarily removed in order to carry out construction must be temporarily replaced, with the replacement providing the same function, until the original item is restored. Any such replacement shall be subject to approval of the Contracting Officer.

o.

Hydrographs are shown on Contract Drawings H-1 through H-9, and elevation duration curves are attached at the end of this section.

1.12 UTILITIES (APR 1984) FAR 52.236-14 (Para. 1.12.1 & 1.12.2 only).  
15 June 1990

a. Availability and Use of Utility Services. The Contractor is responsible for his own electrical power service requirements for the lock construction including power for the cofferdam ground water control system. Currently adequate power exists to dewater and unwater the cofferdam. Power characteristics are 13.8 kV, three phase. Power at the site can be obtained from Louisville Gas and Electric Company (LG&E), 820 West Broadway, P.O. Box 32020, Louisville, Kentucky 40232. The POC is Jim Holderman, (502) 627-3384). The Contractor is responsible for his own water requirements for the Cofferdam Construction. The Contractor will be allowed to connect on to the Corps of Engineers waterline. However, the Contractor will need to install a meter and will be responsible for payment for the amount of water used. The Contractor will be responsible for reading the meter monthly, and shall pay the Corps of Engineers for the water used on a quarterly basis. Exact specifics on whom payment shall be made to shall be coordinated with the Contracting Officer. Separately metered water service is available at the current cofferdam contractor's

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

area west of the Resident Engineer's Office.

b. The Contractor, at its expense and in a workmanlike manner satisfactory to the Contracting Officer, shall install and maintain all necessary temporary connections and distribution lines, and all meters required to measure the amount of each utility used for the purpose of determining charges. Before final acceptance of the work by the Government, the Contractor shall remove all the temporary connections, distribution lines, meters, and associated paraphernalia.

Alteration of Utilities:

a. Where changes and relocations of utility lines are noted to be performed by others, except as noted below in parts b. and c., the Contractor shall give the Contracting Officer at least thirty (30) days written notice in advance of the time that the change or relocation is required.

b. Where changes and relocations of LG&E utility lines associated with the new bridge are noted to be performed by others, the Contractor shall give the Contracting Officer written notice in advance of the time that the change or relocation is required which allows LG&E thirty (30) days to schedule the work and sixty (60) days to complete.

c. Where changes to the railroad crossing are noted to be performed by others, the Contracting Officer shall coordinate with the Contractor as to a mutually agreeable schedule for the crossing work. The railroad shall be allowed to close the road for a maximum of 48 hours to complete the work.

d. In the event that utility lines and crossing work have not been changed or relocated in the time frames outlined above and delay is occasioned to the completion of the work under contract, the Contractor will be entitled to a time extension equal to the period of time lost by the Contractor after the expiration of established period. Any modification to existing or relocated lines required as a result of the Contractor's method of operation shall be made wholly at the Contractor's expense and no additional time will be allowed for delays incurred by such modifications.

Interruptions of Utilities:

a. No utility services shall be interrupted by the Contractor to make connections, to relocate, or for any purpose without approval of the Contracting Officer.

b. Request for Permission to shut down services shall be submitted in writing to the Contracting Officer not less than 72 hours prior to date of proposed interruption. The request shall give the following information:

- (1) Nature of Utility (Gas, L.P. or H.P., Water, etc.)
- (2) Size of line and location of shutoff.
- (3) Buildings and services affected.
- (4) Hours and date of shutoff.
- (5) Estimated length of time services will be interrupted.

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

c. Services shall not be shutoff until receipt of approval of the proposed hours and date from the Contracting Officer.

d. Shutoffs which will cause interruption of Government work operations as determined by the Contracting Officer shall be accomplished during regular non-work hours or on non-work days of the Using Agency without any additional cost to the Government. The 1200-foot lock and maintenance building are operated 24 hours a day, 7 days a week. Any interruption of utilities to these facilities must be accomplished in one four-hour period, as approved by the Contracting Officer. The Contractor shall be responsible for providing temporary utilities for any time that utility interruption is necessary outside of this one four-hour period.

e. Where shutoff of water lines interrupts service to fire hydrants or fire sprinkler systems, the Contractor shall arrange his operations and have sufficient material and personnel available to complete the work without undue delay or to restore service without delay in event of emergency.

f. Flow in gas mains which have been shut off shall not be restored until the Government inspector has determined that all items serviced by the gas line have been shut off.

1.13 QUANTITY SURVEYS (APR 1984) FAR 52.236-16  
24 February 1992

a. Quantity surveys shall be conducted, and the data derived from these surveys shall be used in computing the quantities of work performed and the actual construction completed and in place.

b. The Contractor shall conduct the original and final surveys and surveys for any periods for which progress payments are requested. All these surveys shall be conducted under the direction of a representative of the Contracting Officer, unless the Contracting Officer waives this requirement in a specific instance. The Government shall make such computations as are necessary to determine the quantities of work performed or finally in place. The Contractor shall make the computations based on the surveys for any periods for which progress payments are requested.

c. Promptly upon completing a survey, the Contractor shall furnish the originals of all field notes and all other records relating to the survey or to the layout of the work to the Contracting Officer, who shall use them as necessary to determine the amount of progress payments. The Contractor shall retain copies of all such material furnished to the Contracting Officer.

d. All Contractor surveys shall be conducted by a Land Surveyor licensed in the State of Kentucky. The Land Surveyor must have the capacity to keep up with a contract of this size.

1.14 LAYOUT OF WORK (APR 1984) FAR 52.236-17  
15 June 1990 (**Version 1**)

The Contractor shall lay out its work from Government-established coordinates and bench marks indicated on the drawings, and shall be



## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

responsible for all measurements in connection with the layout. The Contractor shall furnish, at his own expense, all stakes, templates, platforms, equipment, tools, materials, and labor required to lay out any part of the work. The Contractor shall be responsible for executing the work to the lines and grades that may be established or indicated by the Contracting Officer. The Contractor shall also be responsible for maintaining and preserving all stakes and other marks established by the Contracting Officer until authorized to remove them. If such marks are destroyed by the Contractor or through its negligence before their removal is authorized, the Contracting Officer may replace them and deduct the expense of the replacement from any amounts due or to become due to the Contractor.

## 1.15 NOT USED (LINES, GRADES AND LIMITS)

1.16 PERFORMANCE OF WORK BY THE CONTRACTOR (APR 1984) FAR 52.236-1  
(Para. 15 only) 15 June 1990

The Contractor shall perform on the site, and with its own organization, work equivalent to at least 20 percent of the total amount of work to be performed under the contract. This percentage may be reduced by a supplemental agreement to this contract if, during performing the work, the Contractor requests a reduction and the Contracting Officer determines that the reduction would be to the advantage of the Government.

a. For purposes of this paragraph "WORK BY THE CONTRACTOR" is defined as prime Contractor direct contract labor (including testing and layout personnel), exclusive of other general condition or field overhead personnel, material, equipment, or subcontractors. The "TOTAL AMOUNT OF WORK" is defined as total direct contract labor (including testing and layout personnel), exclusive of other general condition or field overhead personnel, material, or equipment.

b. Within 7 days after the award of any subcontract, either by himself or a subcontractor, the Contractor shall deliver to the Contracting Officer a completed SF 1413, "Statement and Acknowledgment". The form shall include the subcontractor's acknowledgement of the inclusion in his subcontract of the clauses of this contract entitled "Davis-Bacon Act," "Contract Work Hours and Safety Standards Act-Overtime Compensation," "Apprentices and Trainees," "Compliance with Copeland Regulations," "Withholding of Funds," "Subcontracts," "Contract Termination-Debarment," and "Payrolls and Basic Records." Nothing contained in this contract shall create any contractual relation between the subcontractor and the Government.

1.17 SUPERINTENDENCE OF SUBCONTRACTORS  
24 February 1992

a. The Contractor shall be required to furnish the following, in addition to the superintendence required by CONTRACT CLAUSE: SUPERINTENDENCE BY THE CONTRACTOR.

(1) If more than 50 percent and less than 70 percent of the value of the contract work is subcontracted, one superintendent shall be

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

provided at the site and on the Contractor's payroll to be responsible for coordinating, directing, inspecting and expediting the subcontract work.

(2) If 70 percent or more of the value of the work is subcontracted, the Contractor shall be required to furnish two such superintendents to be responsible for coordinating, directing, inspecting and expediting the subcontract work.

b. If the Contracting Officer, at any time after 50 percent of the subcontracted work has been completed, finds that satisfactory progress is being made, he may waive all or part of the above requirements for additional superintendence subject to the right of the Contracting Officer to reinstate such requirement if at any time during the progress of the remaining work he finds that satisfactory progress is not being made.

## 1.18 IDENTIFICATION OF EMPLOYEES.

15 June 1990

a. The Contractor shall be responsible for furnishing an identification badge/card to each employee prior to the employees work on-site, and for requiring each employee engaged on the work to display identification as may be approved and directed by the Contracting Officer. Contractor and subcontractor personnel shall wear identifying markings on hard hats clearly identifying the company for whom the employee works. All prescribed identification shall immediately be delivered to the Contracting Officer for cancellation upon release of the employee. When required by the Contracting Officer, the Contractor shall obtain and submit fingerprints of all persons employed or to be employed on the project.

## 1.19 NOT USED (CONTRACTOR-PREPARED NETWORK ANALYSIS SYSTEM )

## 1.20 WARRANTY OF CONSTRUCTION (MAR 1984) ALTERNATE 1 (APR 1984) FAR

52.246-21I.

15 January 1998

## 1.20.1 General Requirements

1.20.1.1 In addition to any other warranties in this contract, the Contractor warrants, except as provided in paragraph 1.20.1.10 of this clause, that work performed under this contract conforms to the contract requirements and is free of any defect in equipment, material, or design furnished, or workmanship performed by the Contractor or any subcontractor or supplier at any tier.

1.20.1.2 This warranty shall continue for a period of 1 year from the date of final acceptance of the work. If the Government takes possession of any part of the work before final acceptance, this warranty shall continue for a period of 1 year from the date the Government takes possession.

(a) As a part of the one year warranty inspection, the Contracting Officer will conduct an infrared roof survey on any project involving a membrane roofing system. This survey will be conducted in

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

accordance with ASTM C1153-90, "Standard Practice for Location of Wet Insulation in Roofing Systems Using Infrared Imaging". In accordance with paragraph 1.20.1.3 and 1.20.1.4 below, the Contractor shall be required to replace all damaged materials and to locate and repair sources of moisture penetration.

1.20.1.3 The Contractor shall remedy at the Contractor's expense any failure to conform, or any defect. In addition, the Contractor shall remedy at the Contractor's expense any damage to Government-owned or controlled real or personal property, when that damage is the result of--

(a) The Contractor's failure to conform to contract requirements; or

(b) Any defect of equipment, material, workmanship, or design furnished.

1.20.1.4 The Contractor shall restore any work damaged in fulfilling the terms and conditions of this clause. The Contractor's warranty with respect to work repaired or replaced will run for 1 year from the date of repair or replacement.

1.20.1.5 The Contracting Officer will the Contractor, in writing, (see para. 1.20.2.3 and 1.20.5) within a reasonable time after the discovery of any failure, defect, or damage.

1.20.1.6 If the Contractor fails to remedy any failure, defect, or damage within a reasonable time after receipt of notice, (see para. 1.20.5) the Government shall have the right to replace, repair, or otherwise remedy the failure, defect, or damage at the Contractor's expense.

1.20.1.7 With respect to all warranties, express or implied, from subcontractors, manufacturers, or suppliers for work performed and materials furnished under this contract, the Contractor shall--

(a) Obtain all warranties that would be given in normal commercial practice;

(b) Require all warranties to be executed, in writing, for the benefit of the Government, if directed by the Contracting Officer; and

(c) Provide names, addresses, and telephone numbers of all subcontractors, equipment suppliers, or manufacturers with specific designation of their area of responsibilities if they are to be contacted directly on warranty corrections; and

(d) Enforce all warranties for the benefit of the Government, if directed by the Contracting Officer.

1.20.1.8 In the event the Contractor's warranty under paragraph of this clause has expired, the Government may bring suit at its expense to enforce a subcontractor's, manufacturer's, or supplier's warranty.

1.20.1.9 Unless a defect is caused by the negligence of the Contractor or

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

subcontractor or supplier at any tier, the Contractor shall not be liable for the repair of any defects of material or design furnished by the Government nor for the repair of any damage that results from any defect in Government-furnished material or design.

1.20.1.10 This warranty shall not limit the Government's rights under the Inspection and Acceptance clause of this contract with respect to latent defects, gross mistakes, or fraud.

1.20.1.11 Defects in design or manufacture of equipment specified by the Government on a "brand name and model" basis, shall not be included in this warranty. In this event, the Contractor shall require any subcontractors, manufacturers, or suppliers thereof to execute their warranties, in writing, directly to the Government.

#### 1.20.2 Performance Bond

1.20.2.1 The Contractor's Performance Bond will remain effective throughout the construction warranty period and warranty extensions.

1.20.2.2 In the event the Contractor or his designated representative(s) fails to commence and diligently pursue any work required under this clause, and in a manner pursuant to the requirements thereof, the Contracting Officer shall have a right to demand that said work be performed under the Performance Bond by making written notice on the surety. If the surety fails or refuses to perform the obligation it assumed under the Performance Bond, the Contracting Officer shall have the work performed by others, and after completion of the work, may make demand for reimbursement of any or all expenses incurred by the Government while performing the work, including, but not limited to administrative expenses.

1.20.2.3 Following oral or written notification of required warranty repair work, the Contractor will respond as dictated by para. 1.20.5. Written verification will follow oral instructions. Failure of the Contractor to respond will be cause for the Contracting Officer to proceed against the Contractor as outlined in the paragraph 1.20.2.2 above.

#### 1.20.3 Pre-Warranty Conference

Prior to contract completion and at a time designated by the Contracting Officer, the Contractor shall meet with the Contracting Officer to develop a mutual understanding with respect to the requirements of this clause. Communication procedures for Contractor notification of warranty defects, priorities with respect to the type of defect, reasonable time required for Contractor response, and other details deemed necessary by the Contracting Officer for the execution of the construction warranty shall be established/reviewed at this meeting. In connection with these requirements and at the time of the Contractor's quality control completion inspection, the Contractor will furnish the name, telephone number and address of a licensed and bonded company which is authorized to initiate and pursue warranty work action on behalf of the Contractor. This point of contact will be located within the local service area of the warrantied construction, will be continuously available, and will be responsive to Government inquiry on warranty work action and status. This requirement

does not relieve the Contractor of any of his responsibilities in connection with other portions of this provision.

#### 1.20.4 Equipment Warranty Identification Tags

1.20.4.1 The Contractor shall provide warranty identification tags on all Contractor and Government furnished equipment which he has installed.

(a) The tags shall be similar in format and size to the exhibits provided by this specification, they shall be suitable for interior and exterior locations, resistant to solvents, abrasion, and to fading caused by sunlight, precipitation, etc. These tags shall have a permanent pressure-sensitive adhesive back, and they shall be installed in a position that is easily (or most easily) noticeable. Contractor furnished equipment that has differing warranties on its components will have each component tagged.

(b) Sample tags shall be submitted for Government review and approval. These tags shall be filled out representative of how the Contractor will complete all other tags.

(c) Tags for Warrantied Equipment: The tag for this equipment shall be similar to the following. Exact format and size will be as approved.

EQUIPMENT WARRANTY  
CONTRACTOR FURNISHED EQUIPMENT

MFG MODEL NO.

SERIAL NO.

CONTRACT NO.

CONTRACTOR NAME

## CONTRACTOR WARRANTY EXPIRES

MFG WARRANTY(IES) EXPIRE

EQUIPMENT WARRANTY  
GOVERNMENT FURNISHED EQUIPMENT

MFG MODEL NO.

SERIAL NO.

CONTRACT NO.

DATE EQUIP PLACED IN SERVICE

MFG WARRANTY(IES) EXPIRE

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(d) If the manufacturer's name (MFG), model number and serial number are on the manufacturer's equipment data plate and this data plate is easily found and fully legible, this information need not be duplicated on the equipment warranty tag. The Contractor warranty expires (warranty expiration date) and the final manufacturer's warranty expiration date will be determined as specified by para. 1.20.1.

1.20.4.2 Execution. The Contractor will complete the required information on each tag and install these tags on the equipment by the time of and as a condition of final acceptance of the equipment.

1.20.4.3 Payment. The work outlined above is a subsidiary portion of the contract work, and has a value to the Government approximating 5% of the value of the Contractor furnished equipment. The Contractor will assign a value of that amount in the breakdown for progress payments mentioned in the Contract Clause: PAYMENTS UNDER FIXED-PRICE CONSTRUCTION CONTRACTS.

1.20.4.4 Equipment Warranty Tag Replacement. As stated in para. 1.20.1.4, the Contractor's warranty with respect to work repaired or replaced shall run for one year from the date of repair or replacement. Such activity shall include an updated warranty identification tag on the repaired or replaced equipment. The tag shall be furnished and installed by the Contractor, and shall be identical to the original tag, except that the Contractor's warranty expiration date will be one year from the date of acceptance of the repair or replacement.

1.20.5 Contractor's Response to Warranty Service Requirements. Following oral or written notification by the Contracting Officer or an authorized representative of the installation designated in writing by the Contracting Officer, the Contractor shall respond to warranty service requirements in accordance with the "Warranty Service Priority List" and the three categories of priorities listed below.

First Priority Code 1 Perform on site inspection to evaluate situation, determine course of action, initiate work within 24 hours and work continuously to completion or relief.

Second Priority Code 2 Perform on site inspection to evaluate situation, determine course of action, initiate work within 48 hours and work continuously to completion or relief.

Third Priority Code 3 All other work to be initiated within 5 work days and work continuously to completion or relief.

The "Warranty Service Priority List" is as follows:

Code 2 Air Conditioning Systems

Code 1 Watertight Doors

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

Code 1     Electrical

- a.   Power failure
- b.   Traffic control devices
- c.   Security lights
- d.   Navigation control lights
- e.   PC hardware/software
- f.   PLC system
- g.   UPS system
- h.   Manual control system
- i.   Emergency power system (generator, automatic transfer switch, etc.)
- j.   CCTV system
- k.   Fire alarm system

Code 1     Heating Systems

Code 1     Mechanical

- a.   Fuel storage tank
- b.   Equipment room ventilation fans
- c.   Hydraulic system

Code 2     Mechanical

- a.   Air compressors

Code 1     Plumbing

- a.   Sumps pumps

Code 2     Plumbing

- a.   Sewage pump
- b.   Fixture drain, supply line commode, or water pipe leaking
- c.   Commode leaking at base

Code 1     Roof Leaks

Temporary repairs will be made where major damage to property is occurring.

Code 2     Roof Leaks

Where major damage to property is not occurring, check for location of leak during rain and complete repairs on a Code 2 basis.

Code 3     Water (Exterior)

- a.   Raw water pumps

Code 2     Water, Hot

1.20.5.2 Should parts be required to complete the work and the parts are not immediately available the Contractor shall have a maximum of 12 hours after arrival at the job site to provide the Contracting Officer or an authorized representative of the installation designated in writing by the Contracting Officer, with firm written proposals for emergency alternatives and temporary repairs for Government participation with the Contractor to provide emergency

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

relief until the required parts are available on site for the Contractor to perform permanent warranty repair. The Contractors proposals shall include a firm date and time that the required parts shall be available on site to complete the permanent warranty repair. The Contracting Officer or an authorized representative of the installation designated in writing by the Contracting Officer, will evaluate the proposed alternatives and negotiate the alternative considered to be in the best interest of the Government to reduce the impact of the emergency condition. Alternatives considered by the Contracting Officer or an authorized representative of the installation designated in writing by the Contracting Officer will include the alternative for the Contractor to "Do Nothing" while waiting until the required parts are available to perform permanent warranty repair. Negotiating a proposal which will require Government participation and the expenditure of Government funds shall constitute a separate procurement action by the using service.

1.21 PAYMENT FOR MOBILIZATION AND PREPARATORY WORK (JAN 1997) DFARS  
252.236-7003  
20 August 1997 (**Version 1**)

a. The Government will make payment to the Contractor under the procedures in this clause for mobilization and preparatory work under item "Mobilization, Demobilization & Preparatory Work" as listed in the Bidding Schedule.

b. Payments will be made for actual payments by the Contractor on work preparatory to commencing actual work on the construction items for which payment is provided under the terms of this contract, as follows--

(1) For construction plant and equipment exceeding \$25,000 in value per unit (as appraised by the Contracting Officer at the work site) acquired for the execution of the work;

(2) Transportation of all plant and equipment to the site;

(3) Material purchased for the prosecution of the contract, but not to be incorporated in the work;

(4) Construction of access roads or railroads, camps, trailer courts, mess halls, dormitories or living quarters, field headquarters facilities, and construction yards;

(5) Personal services; and

(6) Hire of plant.

c. Requests for payment must include--

(1) An account of the Contractor's actual expenditures;

(2) Supporting documentation, including receipted bills or copies of payrolls and freight bills; and

(3) The Contractor's documentation--



## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

(I) Showing that it has acquired the construction plant, equipment, and material free from all encumbrances;

(ii) Agreeing that the construction plant, equipment, and material will not be removed from the site without the written permission of the Contracting Officer; and

(iii) Agreeing that structures and facilities prepared or erected for the prosecution of the contract work will be maintained and not dismantled prior to the completion and acceptance of the entire work, without the written permission of the Contracting Officer.

d. Upon receiving a request for payment, the Government will make payment, less any prescribed retained percentage, if--

(1) The Contracting Officer finds the--

(I) Construction plant, material, equipment, and the mobilization and preparatory work performed are suitable and necessary to the efficient prosecution of the contract; and

(ii) Preparatory work has been done with proper economy and efficiency.

(2) Payments for construction plant, equipment, material, and structures and facilities prepared or erected for prosecution of the contract work do not exceed--

(I) The Contractor's cost for the work performed less the estimated value upon completion of the contract; and

(ii) 100 percent of the cost to the Contractor of any items having no appreciable salvage value; and

(iii) 75 percent of the cost to the Contractor of items which do have an appreciable salvage value.

e.(1) Payments will continue to be made for bid item "Mobilization, Demobilization & Preparatory Work", and all payments will be deducted from the contract price for this item, until the total deductions reduce this item to zero, after which no further payments will be made under this item.

(2) If the total of payments so made does not reduce this item to zero, the balance will be paid to the Contractor in the final payment under the contract.

(3) The retained percentage will be paid in accordance with the Payments to Contractor clause of this contract.

f. The Contracting Officer shall determine the value and suitability of the construction plant, equipment, materials, structures and facilities. The Contracting officer's determinations are not subject to appeal.

g. Plant & Material Removal After Contract Termination: Should the contract be terminated as provided in paragraph 1.61 because of the failure

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

of Congress to provide additional funds for its completion, the Contractor may be permitted to remove plant and material on which payments for preparatory work have been made subject to an equitable deduction from the amounts due to the Contractor to reimburse the United States for the unabsorbed value of such plant and material.

1.22 NOT USED (PAYMENT FOR MOBILIZATION AND DEMOBILIZATION (DEC 1991) DFARS 252.236-7004.)

1.23 SALVAGE MATERIALS AND EQUIPMENT.

24 February 1992

a. The Contractor shall maintain adequate property control records for all materials or equipment specified to be salvaged below or elsewhere in the specifications. These records shall be in accordance with the Contractor's system of property control. The Contractor shall submit his plan for the System of Property Control for approval by the Contracting Officer. The Contractor shall be responsible for the adequate storage and protection of all salvaged materials and equipment and shall replace, at no cost to the Government, all salvage materials and equipment which are broken or damaged during salvage operations as the result of his negligence, or while in his care.

b. The following is a list of items that are to be salvaged by the Contractor for future reuse by the Government.

1. Cofferdam Sheet Piles:

Sheet piling including PZ piling will be declared as salvage once the sheet has been pulled from the water and part or all of it is inspected by the Government and is found to be reusable. The reusable sheet pile will be stored at the project site at a location determined by the Contracting Officer. See specification section 02221 for sheet piling storage requirements. Payment for storage of reusable sheet piling will be made under the bid item "Storage of Reusable Cofferdam Sheet Piling." There is an option for all of the sheet pile to become property of the Contractor. Payment for this option will be made under the bid item "Reusable Cofferdam Sheet Piling" as listed in the Bidding Schedule. No payment will be made under "Storage of Reusable Cofferdam Sheet Piling" if this option is invoked.

2. Generators:

The generators shall be transported and stored at the project site at a location to be determined by the Contracting Officer. Payment for transportation, handling, and storage of the generators will be made under the bid item "Removal and Storage of Salvageable Generators." There is an option for the generators to become property of the Contractor. Payment for this option will be made under the bid item "Salvageable Generators" as listed in the Bidding Schedule. No payment will be made under "Removal and Storage of Salvageable Generators" if this option is invoked.

3. Sandstone Blocks:

The top of the existing north abutment of the swing bridge and the existing 360-foot lock nose pier shall be demolished as shown on Contract Drawing C-2A. These structures contain sandstone block masonry. The intact, whole

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

sandstone blocks shall be transported and stored at the project site, on Shippingport Island north of the existing concrete ramp to the surge basin.

Stone shall be placed near the road to be accessible by a tractor trailer.

No broken sandstone blocks or rubble shall be salvaged or stored at this location. No payment shall be made for special handling of sandstone blocks removed from the abutment or nose pier.

c. The area designated for storage of the generators shall be prepared with geotextile fabric and six inches of compacted CA 6 stone material. The designated storage area may be one or more areas. Each area will require the fabric and stone storage pad. The Contractor is responsible for removing trees as need in the designated storage area. The area designated for storage of the sheet pile shall be prepared as directed in specification section 02221.

1.24 IDENTIFICATION OF GOVERNMENT-FURNISHED PROPERTY (APR 1984) FAR 52.245-3.

2 January 1991

a. The Government will furnish to the Contractor the property identified in the Schedule to be incorporated or installed into the work or used in performing the contract. The listed property will be furnished at the place it is currently being used or as specified below. When the property is transferred or delivered, the Contractor shall verify its quantity and condition and acknowledge receipt in writing to the Contracting Officer. The Contractor shall also report in writing to the Contracting Officer within 24 hours of transfer any damage to or shortage of the property as received. All such property shall be installed or incorporated into the work at the expense of the Contractor, unless otherwise indicated in this contract.

Location of GFP:

The cofferdam and associated equipment is located where it is currently being used at the McAlpine site. A portion of the sheet piling is stored at the McAlpine Lock project site, on Shippingport Island north of the existing concrete ramp to the surge basin. Additional sheet piling is located on the Kentucky bank at the Olmsted Locks construction site in Olmsted, Illinois. For the location of the Olmsted sheet piling, see the Olmsted Locks Reference drawings OLM100.1, sheets X-6, X-22, and X-22A. Only sheet pile located in bays 3 and 5, as shown on sheet X-22A, is government furnished property. All other sheet pile at the Olmsted Kentucky Bank Storage Area shall not be disturbed by the contractor. See Olmsted Locks Reference drawings OLM500.1, sheets H-1 through H-9 for the hydrographs of the Olmsted site. The elevation duration curves for the Olmsted site are attached at the end of section 00800. The wall armor is stored in a storage site off New Dam Road at the Olmsted Locks construction site in Olmsted, Illinois. The storage area is a flat open field easily accessible by trucks. A photograph of the wall armor storage site is attached at the end of section 00800. The sandstone blocks are located at the McAlpine Lock project site, on Shippingport Island north of the existing concrete ramp to the surge basin. Desks for the Control Room of Service Building A shall be f.o.b. truck at the project site.

b. The Contractor is required to furnish all means necessary to load

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

the property for transport. The Contractor is also required to transport the property to the jobsite at its own expense.

c. Each item of property to be furnished under this clause shall be identified in the Schedule by quantity, item, and description.

Quantity	Item and Description
1	Cofferdam (including all cells, connecting arcs, berms, floodway, soldier pile wall, temporary anchors, lighting, emergency stairways, and emergency alarm system)
1	Floodway bridge
2	Flood gates
1	Unwatering platforms and piping
1	Dewatering system (including Transformer Stations, Pad Mounted Generators, Standby Generator, Submersible Pumps, Electrical switches & panelboards, Primary and Secondary conductors, Discharge piping, and Concrete Bollards)
150	PS 27.5 Sheet piles (109 LF or longer), located at the McAlpine Lock project site
See attachment	PS 27.5 Sheet piles, located at the Olmsted Locks construction site (For quantity and lengths of this sheet piling, see attachment at the end of this section)
19,600 LF	Wall Armor AT 08x58.4 Sections (56 LF or longer)
<b>*1</b>	
30	<b>Large, rough sandstone blocks for contractor's use in producing the required stone benches and stone bollards as indicated on the plans</b>
2	<b>Control Consoles</b> for Control Room of Service Building A
4	<b>Auxiliary Work Tables</b> for Control Room of Service Building A

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d. The Contractor shall be responsible for maintaining, servicing, and repairing the cofferdam, floodway bridge, flood gates, unwatering system and dewatering system, including maintenance of the embankment areas, cofferdam stability berms, and stone protection adjacent thereto during the life of this contract. For additional details see specification section 02170 COFFERDAM.

e. The sheet piles located at the McAlpine Lock project site shall be furnished for construction of Alternative 1, Approach Wall Drilled Shaft Design or Alternate 2, Approach Wall Cell Design. The sheet piles located at the Olmsted Locks construction site shall be furnished for construction of Alternate 2, Approach Wall Cell Design only.

f. The government-furnished wall armor AT 08x58.4 sections are shown on Contract Drawing S-384. These sections are unpainted. Each section shall be split by the Contractor to provide two wall armor "T" sections as shown in Section 1/S384. The Contractor shall be responsible for splitting the sections and all fabrication, sandblasting and surface preparation, and painting necessary to produce the final wall armor. Anchor straps and stiffener plates shall be provided by the Contractor.

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

## 1.25 NOT USED (AGGREGATE SOURCES)

## 1.26 PROJECT SIGN

1 August 1996

General. The Contractor shall furnish and erect at the location directed one project sign.

Exact placement location will be designated by the Contracting Officer. The panel sizes and graphic formats have been standardized for visual consistency throughout all Corps operations.

Panels are fabricated using HDO plywood with dimensional lumber uprights and bracing.

All legends are to be painted in the sizes and styles as specified by the graphic formats shown at the end of this section. The signs (including back and edges), posts and braces shall be given two coats of Benjamin Moore No. 120-60 poly-silicone enamel or approved equal before lettering. The 4' x 4' right section of the project sign shall be white with black lettering. The upper 2' x 2' left section of the project sign shall be communication red (CR) with white lettering. The lower 2' x 2' left section of the project sign shall be blue with white lettering. Paint colors shall be as follows:

Black	-	Federal Standard 595a	Color Number 27038
White	-	Federal Standard 595a	Color Number 27875
Red	-	PANTONE 032	
Blue	-	Sherwin Williams Signature Blue No. SW1798	

An example of the sign including mounting and fabrication details are also provided at the end of this section.

Name of the project shall be as follows:

McAlpine Lock Replacement Project  
Lock Construction

Name of the designer shall be as follows:

Louisville District

Name of local sponsor shall be as follows:

Inland Waterways Trust Fund

Erection and Maintenance.

a. The signs shall be erected at the designated location(s). Signs shall be plumb and backfill of post holes shall be well tamped to properly support the signs in position throughout the life of the contract. The signs shall be maintained in good condition until completion of the

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

contract, shall remain the property of the Contractor, and shall be removed from the site upon completion of work under the contract.

b. The Corps of Engineers logo and the local sponsor's logo will be provided by the Contracting Officer.

c. Payment. No separate payment will be made for furnishing and erecting the project signs as specified and costs thereof shall be considered a subsidiary obligation of the Contractor.

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1.27 NOT USED (CONTRACTOR QUALITY CONTROL)

1.28 WAGE RATES

1 February 1995

The decision of the Secretary of Labor, covering rates of wages, including fringe benefits to be paid laborers and mechanics performing work under this contract, is attached hereto. The payment for all classes of laborers and mechanics actually employed to perform work under the contract will be specified in the following contract clauses: DAVIS-BACON ACT, CONTRACT WORK HOURS AND SAFETY STANDARDS ACT, and THE COPELAND ACT.

1.29 PURCHASE ORDERS

15 June 1990

Five copies of all purchase orders, for items requiring shop inspection, showing firm names and addresses, shall be submitted to the Contracting Officer when orders for materials are placed. Orders shall be so worded or marked that each item, piece or member can be definitely identified on the drawings. Purchase prices are not necessary and may be obliterated from the copies of the purchase orders furnished.

1.30 INTERFERENCE WITH TRAFFIC AND PUBLIC AND PRIVATE PROPERTY.

15 June 1990

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a. The Contractor at all times shall dispose his plant and conduct the work in such manner as to cause as little interference as possible with private and public travel. The Contractor shall submit a Traffic Control Plan (TCP) outlining the traffic control scheme and phasing which will maintain public traffic through the project. The TCP shall maintain the following constraints and/or sequence of work:

- The existing By-Pass Road to be removed as shown on Sheet C-12A of the contract drawings, shall remain open to the maximum extent possible during construction of the bridge.

- The asphalt surface course of Marine Street shall not be placed until the end of the contract. The initial pavement section shall include the stone subbase and base courses and at least 2.5" of asphalt base. The Contractor shall maintain the asphalt base throughout the contract. **Prior to completion of the project, the Contractor shall repair the asphalt base by milling and/or leveling as necessary to achieve smoothness tolerances required by specification section 02741. Immediately before placing the surface course, the underlying course shall be cleaned of dust and debris**

**and a tack coat applied in accordance with the contract specifications.**

- Construction traffic shall be separated from public traffic to the maximum extent possible. Temporary roads may be constructed to provide for the safe movement of traffic. Obtain the Contracting Officer's approval for all temporary facilities constructed solely to accommodate construction operations. When approved, construct and maintain such temporary facilities, including furnishing and applying surfacing and dust control material. Pave all temporary roadways intended for public traffic for maintenance of traffic.

- When a section of roadway must be closed to through traffic, provide and maintain satisfactory temporary facilities for the maintenance of local traffic.

- Furnish, erect, and maintain all traffic control devices, including flaggers, necessary to maintain through and local traffic according to the MUTCD. Traffic control devices include channelization devices, signs, temporary pavement markings, and other items necessary to maintain and control traffic in the construction zone.

**b. The Contractor shall provide maintenance of public roads and bridges, existing and new, within the project site during the life of the contract. Maintenance shall include, but not be limited to, removal of debris in catch basins, curb inlets, and bridge scuppers, snow/ice removal, and daily street cleaning.**

**c. Damage to roads and bridges shall be repaired to as good a condition as they were prior to the beginning of work and to the satisfaction of the Contracting Officer. Damage is defined as gouging or rutting of the pavement in excess of 2 inches. The Contractor shall survey the condition of the roads monthly with the Contracting Officer, and shall repair any damage noted in these inspections as directed by the Contracting Officer. All potholes shall be repaired immediately. The Contractor shall also be responsible for repairing any damage to 26th Street (truck bypass) from the entrance to Lannan City Park.**

**d. The Contractor shall provide and maintain as may be required by the State of Kentucky Transportation Cabinet, proper barricades, fences, danger signals and lights, provide a sufficient number of watchmen, and take such other precautions as may be necessary to protect life, property and structures, and shall be liable for and hold the Government free and harmless from all damages occasioned in any way by his act or neglect, or that of his agents, employees, or workmen.**

**e. In order to keep proper control of vehicles in the work area, all Contractor's vehicles and supplier's vehicles shall display suitable permanent identification as approved by the Contracting Officer.**

**f. Project employees shall be allowed access to all areas in performance of their duties 24 hours a day.**

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#### 1.31 SEQUENCE OF WORK.

The following sequence of work requirements shall be met:

a. The Contractor shall coordinate with Norfolk-Southern railroad 30 days in advance of work in the vicinity of the railroad tracks. (Reference Contract

Drawing C-47.)

- b. Follow the construction sequence requirements for the approach wall shown on Contract Drawings S-237I, S-238, S-239N, S-241, S-246, S-246A, S-247, and S-247B.
- c. Demolition of the existing soldier pile wall at the north abutment of the swing bridge shall not begin until the new access bridge is complete and the bridge is in service. (Reference Contract Drawing C-2A.)
- d. Demolition of the swing and bascule bridges and their supports shall not begin until the construction of monoliths L20 and SM22 and the new access bridge is complete and the bridge is in service. (Reference Contract Drawings C-12 and S-322 to S-374D.)
- e. Construction of the bridge piers on monoliths L20 and SM22 of the new lock shall not begin until the construction of monoliths L20 and SM22 is complete. (Reference Contract Drawings S-106 to S-110, S-143 to S-147, and S-338 to S-340.)
- f. The drilled shafts, to be used for the floating mooring bitt sockets, shall be drilled at the locations shown in the plans. These shall be drilled to elevation 361 before excavating the lock chamber to its founding elevations. After excavation of the lock chamber foundation, the mooring bitt sockets shall be cleaned of any loose debris, before forming the concrete around the socket. (Reference Contract Drawing S-211.)
- g. Bridge piers no. 4 and 5 shall be constructed such that access to the Resident Engineer's office and the existing private business is always maintained. Work in this area shall be performed during night and weekend hours in order to minimize traffic disruptions. (Reference Contract Drawings S-322 and S-323.)
- h. Portions of the approach walls cannot be built until portions of the cofferdam have been removed. (Reference Contract Drawings C-1 and C-2.)
- i. Construction sequence requirements listed in paragraph 1.30.a. regarding the removal of the existing By-Pass Road and the paving of Marine Street shall be followed.
- j. Construction sequence requirements listed in Section 02170 COFFERDAM, paragraph 3.5, regarding temporary cofferdam berm removal for excavation of the upstream intake at monolith SM 23 and the downstream diffuser, shall be followed.

**\*1**

- k. The new esplanade fill adjacent to Monoliths M31 and M32 shall not be constructed above pre-existing grades until the concrete rock anchor piers, the vertical strand anchors, and the inclined anchor bars are completed on the esplanade face of these monoliths. **The excavation for construction of the rock anchor piers on M31 and M32 shall not be commenced until the new access bridge is complete and the bridge is in service, and, the upstream pool elevation is not expected to exceed elevation 425 during the construction of the rock anchor piers. Demolition of the Swing Bridge abutment and roadway fill will be required for the excavation.** The horizontal anchor bars shall be installed, tensioned, and accepted prior to tensioning the vertical strand anchors. In addition, the temporary excavation shall be restored to pre-existing grades prior to tensioning the vertical strand anchors. **(Reference Contract Drawings S-177A to S-177C.)**

**\*1**

- l. Removal of the berm for construction of the new retaining wall shall be done when the upper pool is below elevation 425. (Reference Contract Drawing S-1.)
- m. Excavation to rock will be necessary for construction of the



## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

cast-in-place concrete cut-off wall. This excavation shall not be performed when the upstream pool elevation is at or above elevation 425, or can reasonably be expected to be above this elevation prior to the fill materials being replaced. Once the excavation is initiated, construction of the cut-off wall shall proceed expeditiously until the embankment can be replaced to the original grades. (Reference Contract Drawing S-1.)

n. Before the cofferdam is rewatered, the inclined toe anchors in Monoliths M4 and M13 of the existing 1200-foot lock shall be detensioned. These anchors shall not be detensioned when the upper pool level is anticipated to exceed elevation 425 prior to rewatering. The vertical anchors in Monoliths M1 through M15 shall be detensioned following rewatering. (Reference Contract Drawing C-1.)

o. The cofferdam cannot be rewatered until all of the all of the requirements listed in Section 02170 COFFERDAM, paragraph 3.7 are complete.

p. The existing metal towers located upstream of the existing bridges currently support a Louisville Gas & Electric Co. (LG&E) owned communications line. This line must remain in place until completion of the bridge. After bridge completion, it will be routed by LG&E through a conduit attached to the bridge. After this work is complete, the towers and their foundations shall be demolished by the Contractor. (Reference Contract Drawing E-12.)

q. The new lock and the existing 1200-foot lock shall not be filled simultaneously. In addition, filling of the new lock shall not be initiated during the five-minute window starting 28 minutes after the existing lock has begun filling and ending 33 minutes after the existing lock has begun filling.

r. See also paragraph COMMENCEMENT, PROSECUTION AND COMPLETION OF WORK for requirements regarding the commencement of administrative work and physical work.

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**s. Construction sequence requirements listed in Section 02210 SUBSURFACE DRILLING, SAMPLING, AND TESTING, paragraph 1.7.1, regarding core drilling at monolith foundations, shall be followed.**

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#### 1.32 GOVERNMENT FIELD OFFICE FACILITIES AND SERVICES.

1 August 1996

a. Lock Field Office Located in Cofferdam. The Contractor shall furnish a field office located down in the cofferdam for the exclusive use of the Government quality assurance representatives. The field office shall be a 12'x30' trailer with an office at one end. Each door shall have steps and a landing on the outside. It shall be watertight, lockable, with open/close windows, properly heated, with electrical hookup, adequately lighted, with wall receptables, ventilated, air conditioned, and furnished with one lockable desk (30" x 60"), one swivel chair, two 4-drawer filing cabinets, one 36" x 72" table, one plan table with stool, eight straight back chairs, one rack for holding full-size drawings, one small refrigerator, one microwave oven, mini-blinds on the windows, and one port-o-let for use by the Government. All furnishings shall be new. Electrical service and service to the port-o-let will be the responsibility of the Contractor. The Contractor shall provide cleaning and maintenance services to include weekly cleanup, sweeping, mopping, dusting, and trash removal. The Contractor shall also furnish handsoap, toilet paper, hand towels, trash cans, and liners. The Contractor will also be responsible for setting up, leveling, and anchoring the trailer. The Contractor may be

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

required to move the trailer five times during the life of the Contract at the Contracting Officer's request. Each time the trailer is moved, electrical hook-up will be required for heating, cooling, power, and lighting. The field office and furnishings will revert back to the Contractor once the cofferdam is rewatered.

b. Payment. No separate payment will be made for these Contractor-furnished services, and all costs thereof shall be incidental to the various bid items of the contract.

## 1.33 NOT USED (COMPLIANCE WITH POST/BASE REGULATIONS)

1.34 EQUIPMENT AND OWNERSHIP AND OPERATING EXPENSE SCHEDULE (MAR 1995)  
EFAR 52.231-5000.  
20 March 1997

a. This does not apply to terminations. See 52.249,5000, Basis for Settlement of Proposals and FAR Part 49.

b. Allowable cost for construction and marine plant and equipment in sound workable condition owned or controlled and furnished by a contractor or subcontractor at any tier shall be based on actual cost data for each piece of equipment or groups of similar serial and series for which the Government can determine both ownership and operating costs from the contractor's accounting records. When both ownership and operating costs cannot be determined for any piece of equipment or groups of similar serial or series equipment from the contractor's accounting records, costs for that equipment shall be based upon the applicable provisions of EP 1110-1-8, Construction Equipment Ownership and Operating Expense Schedule, Region II. Working conditions shall be considered to be average for determining equipment rates using the schedule unless specified otherwise by the Contracting Officer. For equipment not included in the schedule, rates for comparable pieces of equipment may be used or a rate may be developed using the formula provided in the schedule. For forward pricing, the schedule in effect at the time of negotiations shall apply. For retroactive pricing, the schedule in effect at the time of negotiations shall apply.

c. Equipment rental costs are allowable, subject to the provisions of FAR 31.105(d)(ii) and FAR 31.205-36. Rates for equipment rented from an organization under common control, lease-purchase arrangements, and sale-leaseback arrangements, will be determined using the schedule, except that actual rates will be used for equipment leased from an organization under common control that has an established practice of leasing the same or similar equipment to unaffiliated lessees.

d. When actual equipment costs are proposed and the total amount of the pricing action exceeds the small purchase threshold, the Contracting Officer shall request the Contractor to submit either certified cost or pricing data, or partial/limited data, as appropriate. The data shall be submitted on Standard Form 1411, Contract Pricing Cover Sheet.

e. Whenever a modification or equitable adjustment of contract price is required, the contractor's cost proposals for equipment ownership and

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

operating expenses shall be determined in accordance with the requirements of SPECIAL CONTRACT REQUIREMENT: EQUIPMENT OWNERSHIP AND OPERATING EXPENSE SCHEDULE. A copy of EP 1110-1-8, "Construction Equipment Ownership and Operating Expense Schedule" is available for review at the office of the District Engineer, Room 821, 600 Dr. Martin Luther King, Jr. Place, Louisville, Kentucky, or a copy may be ordered from the Government Printing Office at a cost of \$11.00 by calling telephone no. (301) 953-7974.

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11	008-022-00264-2
12	008-022-00265-1

## 1.35 LABOR, EQUIPMENT, AND MATERIAL REPORTS

15 June 1990

Daily Equipment Report. The Contractor shall submit a daily report of all Contractor-owned or rented equipment at the jobsite. A similar report is required for all subcontractor equipment. The subcontractor's report may be separate or included with the Contractor's report provided the equipment is adequately identified as to ownership. The required equipment report shall include each item of equipment (hand-operated small tools or equipment excluded) on the job and shall specifically identify each item as to whether it is Contractor-owned or rented, shifts, hours of usage, down time for repairs, and standby time. Identification of the equipment shall include make, model and plant number of all items. Separate identification by a key sheet providing these data may be utilized with the daily report indicating the type of equipment and the equipment plant numbers. The format of the Daily Equipment Report will be as approved by the Government in the field.

Labor, Equipment & Material Reports for Extra Work/Cost. A Report shall also be submitted by the Contractor listing any labor, equipment and materials expended on and/or impacted by any change order directed by the Government and for which total price/time agreement has not been reached. These requirements also apply to subcontractors at any tier. The same Report is required at any time the Contractor claims or intends to claim for extra costs whether or not there is Government recognition

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

(constructive changes). This requirement is in addition to any Contractor "Notice" or "Reservation of Rights". Submittal of such a report will not be construed as satisfying the "Notice" required under the "Changes" clause or any other clause. But, absence of such Reports submitted to the Government contemporaneously with the alleged extra work/cost will be considered as evidence that no such extra work/cost occurred that are chargeable to the Government.

The Report shall be detailed to the degree required by the Government in the field and shall contain the following as a minimum:

- a. The cause of the extra labor, equipment or materials costs.
- b. For extra labor - Indicate crew, craft, hours, location and cost. Describe nature or type of extra costs, i.e, extra work, overtime, acceleration, interference, reassignment, mobilizations and demobilizations, supervision, overhead, type of inefficiency, etc.
- c. For extra equipment - Indicate type and description, hours, location, cost; whether working, idle, standby, under repair, extra work involved, etc.
- d. For extra materials - Indicate type and description, where used, whether consumed, installed or multi-use, quantity, cost, extra work involved, etc.
- e. Affected activities - Relate to Contract Schedule (Network Analysis); demonstrate whether delay or suspension is involved.
- f. Segregate all entries by prime and each subcontractor.
- g. Summarize costs daily and by cumulative subtotal or with frequency required by the Government.

This Report will not be considered as evidence that any of the alleged extra costs actually occurred. The Report will be used to check against over obligation of funds for change orders directed prior to price/time agreement and to track alleged extra costs the Contractor considers otherwise chargeable against the Government. The Government may respond at any interval to either challenge, amend or confirm the Report. Absence of a Government response is not to be considered acquiescence or denial. The Government may order work stoppage if deemed necessary to avoid overobligation of funds. The frequency of the report shall be daily or as otherwise approved by the Government representative in writing.

1.36 NOT USED (ILLINOIS RETAILER'S OCCUPATIONAL TAX AND USE TAX)

1.37 NOT USED (INDIANA SALES AND USE TAX)

1.38 NOT USED (OHIO SALES AND USE TAX)

1.39 PROGRESS PHOTOGRAPHS  
18 Nov 1999)

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

The Contractor shall, during the progress of the work, furnish the Contracting Officer photographs, slides, digital photographs (furnished on CD-ROM) and negatives depicting construction progress. The photographic work furnished shall be commercial quality as determined by the Contracting Officer. The photography shall be performed between the first and fifth of each month and the photographs, slides, digital photographs and negatives delivered to the Contracting Officer not later than the 15th of each month taken. A minimum of ten views from different positions shall be taken as directed to show, inasmuch as possible, work accomplished during the previous month. At least, one set of photographs, slides, digital photographs and negatives will be made at completion of the contract, after final inspection by the Contracting Officer. Aerial photographs shall be furnished in lieu of conventional photographs periodically, at least on alternate months, at the discretion of the Contracting Officer. The photographs shall be 8"x10" color prints and the slides 35 mm color. The digital photographs shall be Kodak KDC format or equivalent. Each photograph and slide shall be identified on the face of the picture or the border of the slide giving date made, contract title and number, location of work, as well as a brief description of work depicted. Each negative and digital photograph file will be identified with the same information on a sheet of paper by cross-referencing to the number on the negative and the digital photograph filename. Two copies of photographs and slides, along with the original negatives and digital photograph files of each view taken, shall be furnished to the Contracting Officer by the time stipulated above. In addition, no separate payment will be made for these services and all costs in connection thereto shall be considered a subsidiary obligation of the Contractor.

1.40 PAYMENT FOR MATERIALS DELIVERED OFFSITE. (MAR 1995) EFARS 52.232-5000.  
20 March 1997

Pursuant to CONTRACT CLAUSE: PAYMENTS UNDER FIXED-PRICE CONSTRUCTION CONTRACTS, materials delivered to the Contractor at locations other than the site of the work may be taken into consideration in making payments if included in payment estimates and if all the conditions of the CONTRACT CLAUSES are fulfilled. Payment for items delivered to locations other than the worksite will be limited to:

- (1) Materials required by the technical provisions,
- (2) Materials that have been fabricated to the point where they are identifiable to an item of work required under this contract.

Such payment will be made only after receipt of paid or receipted invoices or invoices with canceled check showing title to the items in the prime contract and including the value of material and labor incorporated into the item.

1.41 INSURANCE--WORK ON A GOVERNMENT INSTALLATION (SEP 1989) FAR 52.228-5.  
17 July 1992

The Contractor shall, at its own expense, provide and maintain during the entire performance of this contract at least the kinds and minimum amounts of insurance required in the Schedule or elsewhere in the contract.

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

(1) Coverage complying with State laws governing insurance requirements, such as those requirements pertaining to Workman's Compensation and Occupational Disease Insurance. Employer's Liability Insurance shall be furnished in limits of not less than \$100,000.00 except in states with exclusive or monopolistic funds.

(2) Comprehensive General Liability Insurance for bodily injury coverage shall be furnished in limits of not less than \$500,000 per occurrence.

(3) Comprehensive Automobile Liability Insurance for both bodily injury and property damage, shall be furnished in limits of not less than \$200,000.00 per person, \$500,000.00 per accident for bodily injury, and \$20,000.00 per accident for property damage. When the Financial Responsibility or Compulsory Insurance Law of the State requires higher limits, the policy shall provide for coverage of at least those higher limits.

(4) Marine Liability Insurance furnished in a limit of not less than \$1,000,000.00 per accident for property damage.

(5) Pollution Insurance (Oil Spills, etc.) furnished in a limit of not less than \$1,000,000.00 per accident.

The Contractor shall, at its own expense, provide and maintain during the performance of work at or near the railroad at least the kinds and minimum amounts of insurance listed below.

(1) Commercial General Liability Insurance having a combined single limit of not less than \$2,000,000 per occurrence for all loss, damage, cost, and expenses. Said policy shall include "explosion, collapse, and underground hazard" ("XCU") coverage, shall be endorsed to name Norfolk Southern Railway Company as an additional insured, and shall include a severability of interests provision.

(2) Railroad Protective Liability Insurance having a combined single limit of not less than \$2,000,000 each occurrence and \$6,000,000 in the aggregate applying separately to each annual period. Said policy shall provide coverage for all loss, damage or expense arising from bodily injury and property damage liability, and physical damage to property attributed to acts or omissions at the job site. The named insured shall read: Norfolk Southern Railway Company, Three Commercial Place, Norfolk, Virginia 23510-2191, Attn: D.W. Fries, Director Risk Management.

Before commencing work under this contract, the Contractor shall submit to the Contracting Officer in writing that the required insurance certification has been obtained. The policies evidencing required insurance shall contain an endorsement to the effect that any cancellation or any material change adversely affecting the Government's interest shall not be effective (1) for such period as the laws of the State in which this contract is to be performed prescribe, or (2) until 30 days after the insurer or the Contractor gives written notice to the Contracting Officer, whichever period is longer.

The Contractor shall insert the substance of this clause, including this paragraph, in subcontracts under this contract that require work on a Government installation and shall require subcontractors to provide and maintain the insurance required in the Schedule or elsewhere in the contract. The Contractor shall maintain a copy of all subcontractors' proofs of required insurance, and shall make copies available to the Contracting Officer upon request.

\*1

1.42 **IMPLEMENTATION OF GOVERNMENT RESIDENT MANAGEMENT SYSTEM**

The Government will use computer software called Resident Management System for Windows (RMS) to assist in its monitoring and administration of this contract. The Contractor shall use the Government-furnished Construction Contractor Module of RMS, referred to as QCS, to record, maintain, and submit various information throughout the contract period. The use of QCS is covered by Section 01312, QUALITY CONTROL SYSTEM (QCS). QCS produces a majority of the forms required in this contract for submission to the Government. Some of these forms are shown as samples at the end of this section. They include ENG 4288 (Submittal Register), ENG 4025 (Transmittal form), CQC Daily Report, Definable Feature of Work Form, User Schooling Information Form, Quality Control Testing Information, Subcontractor Information Form, and Pay Activities and Activity Information.

\*1

1.43 TIME EXTENSIONS FOR UNUSUALLY SEVERE WEATHER. ER 415-1-15  
(31 OCT 89)  
2 January 1991

This provision specifies the procedure for the determination of time extensions for unusually severe weather in accordance with the contract clause entitled "Default: Fixed Price Construction)". In order for the Contracting Officer to award a time extension under this clause, the following conditions must be satisfied:

The weather experienced at the project site during the contract period must be found to be unusually severe, that is, more severe than the adverse weather anticipated for the project location during any given month.

The unusually severe weather must actually cause a delay to the completion of the project. The delay must be beyond the control and without the fault or negligence of the Contractor.

The following schedule of monthly anticipated adverse weather delays is based on National Oceanic and Atmospheric Administration (NOAA) or similar data for the project location and will constitute the base line for monthly weather time evaluations. The Contractor's progress schedule must reflect these anticipated adverse weather delays in all weather dependent activities.

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

MONTHLY ANTICIPATED ADVERSE WEATHER DELAY WORK DAYS  
(BASED ON (5) DAY WORK WEEK)

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
(11)	(8)	(6)	(6)	(5)	(4)	(5)	(4)	(4)	(4)	(4)	(6)

MONTHLY ANTICIPATED ADVERSE WEATHER DELAY WORK DAYS  
(BASED ON (6) DAY WORK WEEK)

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
(14)	(10)	(7)	(7)	(6)	(5)	(6)	(5)	(5)	(5)	(5)	(7)

MONTHLY ANTICIPATED ADVERSE WEATHER DELAY WORK DAYS  
(BASED ON (7) DAY WORK WEEK)

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
(16)	(12)	(8)	(8)	(7)	(5)	(7)	(5)	(6)	(6)	(6)	(8)

Upon acknowledgment of the Notice to Proceed (NTP) and continuing throughout the contract, the Contractor will record on the daily CQC report, the occurrence of adverse weather and resultant impact to normally scheduled work. Actual adverse weather delay days must prevent work on critical activities for 50 percent or more of the Contractor's scheduled work day. The number of actual adverse weather delay days shall include days impacted by actual adverse weather (even if adverse weather occurred in previous month), be calculated chronologically from the first to the last day of each month, and be recorded as full days. If the number of actual adverse weather delay days exceeds the number of days anticipated listed above, the Contracting Officer will convert any qualifying delays to calendar days, giving full consideration for equivalent fair weather work days, and issue a modification in accordance with the contract clause entitled "Default (Fixed Price Construction)".

1.44 USE OF INCLINOMETER FOR LONG BED DUMP TRUCKS (DACF BULLETIN 25 MARCH 1993)

4 June 1993

The recommendation of EM 385-1-1, Section 16.B.15, is mandatory for this project.

1.45 AVAILABILITY OF SAFETY AND HEALTH REQUIREMENTS MANUAL (EM 385-1-1).  
17 May 2000

As covered by CONTRACT CLAUSE "ACCIDENT PREVENTION", compliance with EM 385-1-1 is a requirement for this contract. Copies may be purchased for \$31.00 each at the following address:

United States Government Bookstore  
Room 118, Federal Building  
1000 Liberty Avenue  
Pittsburgh, PA 15222-4003



## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

Telephone: (412) 395-5021 FAX: (412) 395-4547

Or downloaded from the following website:

<http://www.usace.army.mil/inet/usace-docs/eng-manuals/em385-1-1/toc.htm>

## 1.46 NOT USED (FIRE PROTECTION DURING CONSTRUCTION)

## 1.47 HAUL ROADS

2 Jan 1996

Whenever practical, one-way haul roads shall be used on this contract. Haul roads built and maintained for this work shall comply with the following:

a. One-way haul roads for off-the road equipment; e.g., belly dumps, scrapers, and off-the-road trucks shall have a minimum usable width of 25 ft. One-way haul roads for over-the-road haulage equipment only (e.g., dump trucks, etc.) may be reduced to a usable width of 15 ft. When the Contracting Officer determines that it is impractical to obtain the required width for one-way haul roads (e.g., a road on top of a levee), a usable width of not less than 10 ft. may be approved by the Contracting Officer, provided a positive means of traffic control is implemented. Such positive means shall be signs, signals, and/or signalman and an effective means of speed control.

b. Two-way haul roads for off-the-road haulage equipment shall have a usable width of 60 ft. Two-way haul roads for over-the-road haulage equipment only may be reduced to a usable width of 30 ft.

c. Haul roads shall be graded and otherwise maintained to keep the surface free from potholes, ruts, and similar conditions that could result in unsafe operation.

d. Grades and curves shall allow a minimum sight distance of 200 ft. for one-way roads and 300 ft. for two-way roads. Sight distance is defined as the centerline distance an equipment operator (4.5 ft. above the road surface) can see an object 4.5 ft. above the road surface. When conditions make it impractical to obtain the required sight distance (e.g., ramps over levees), a positive means of traffic control shall be implemented.

e. Dust abatement shall permit observation of objects on the roadway at a minimum distance of 300 ft.

f. Haul roads shall have the edges of the usable portion marked with posts at intervals of 50 ft. on curves and 200 ft. maximum elsewhere. Such markers shall extend 6 ft. above the road surface and, for nighttime haulage, be provided with reflectors in both directions.

## 1.48 NOT USED (RADIOACTIVE MATERIAL/EQUIPMENT)

## 1.49 NOT USED (CONSTRUCTION/SITE MANAGEMENT STANDARDS FOR CONSTRUCTION ON AMC INSTALLATIONS)

## 1.50 CONSTRUCTION HAZARD COMMUNICATION

1 November 1991

The Contractor is required to comply with the requirements of the OSHA Hazard Communication Standard (29 CFR 1926.59). This standard is designed to inform workers of safe and appropriate methods of working with hazardous substances in the workplace. The standard has five requirements, and every hazardous or potentially hazardous substance used or stored in the work area is subject to all five. They are:

(1) Hazard Evaluation. Any company which produces or imports a chemical or compound must conduct a hazard evaluation of the substance to determine its potential health or physical hazard. The hazard evaluation consists of an investigation of all the available scientific evidence about the substance. The Contractor is required to assure that all producers (manufacturer/distributors) have performed these evaluations and transmit the required information with any hazardous materials being used or stored on the project site. From the hazard evaluation, a substance may be classified as a health hazard, or a physical hazard. These classifications are then further broken down according to type:

Health Hazards	Physical Hazards
Carcinogens	Combustible liquids
Irritants	Compressed gases
Sensitizers	Explosives
Corrosives	Flammables
Toxic substances	Organic peroxides
Highly toxic substances	Unstable substances
Substances harmful to specific organs or parts of the body	Water-reactive substances

(2) Warning Labels. If a chemical is hazardous or potentially hazardous, the producer or importer must affix a warning label to every container of that chemical before it leaves his facility. The Contractor must assure these labels are attached and legible. The label must identify the chemical, state the hazard, and give the name and address of the producer or importer. If the hazardous substance is transferred to another container, that container must then be labeled, tagged, or marked with the name of the chemical and the appropriate hazard warning. Warning labels should be replaced immediately if they are defaced or removed.

(3) Material Safety Data Sheets. The producer or importer must also supply a material safety data sheet (MSDS). The Contractor must keep these available in the work area where the substance is used, so that the people using the substance can easily review important safety and health information, such as:

The hazard possible from misuse of the substance  
Precautions necessary for use, handling, and storage  
Emergency procedures for leaks, spills, fire and first aid  
Useful facts about the substance's physical or chemical properties

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

(4) Work Area Specific Training. Because of hazardous substance may react differently depending on how it is used or the environment of the work area, the Contractor must conduct work area specific training; special training which takes the Contractor's operations, environment, and work policies into consideration. Work area training presents:

The hazardous substances which are present in the work place and the hazards they pose

Ways to protect against those hazards, such as protective equipment, emergency procedures, and safe handling

Where the MSDS's are kept, and an explanation of the labeling system  
Where the Contractor's written Hazard Communication Program is located

(5) The Written Hazard Communication Program. In accordance with OSHA requirements, the Contractor must prepare a written Hazard Communication Program. This document will be included in the Contractor's Accident Prevention Plan. This document states how the Contractor plans to ensure that hazardous materials are appropriately labeled, how and where MSDS's will be maintained, and how employees will be provided with specific information and training.

1.51 NOT USED(ENVIRONMENTAL PROTECTION CLAUSE TANK CLEANING AND PAINTING)

1.52 MECHANICAL ROOM LAYOUT (ORL).  
24 FEBRUARY 1992

Detailed mechanical room layout drawings shall be submitted for approval in accordance with SD-04 Section 01335. Layout drawings shall show location and maintenance clearances for all mechanical room equipment, and all utility runs/chases for mechanical, electrical, telephone and other similar systems. Drawings shall be submitted at the same time as the submittals for the equipment to be located within the mechanical room.

1.53 RIGHTS IN TECHNICAL DATA--NONCOMMERCIAL ITEMS (NOV 1995)  
252.227-7013 (JUN 1995).  
20 March 1997

(a) Definitions. As used in this clause:

(1) "Computer data base" means a collection of data recorded in a form capable of being processed by a computer. The term does not include computer software.

(2) "Computer program" means a set of instructions, rules, or routines recorded in a form that is capable of causing a computer to perform a specific operation or series of operations.

(3) "Computer software" means computer programs, source code, source code listings, object code listings, design details, algorithms, processes, flow charts, formulae and related material that would enable the software to be reproduced, recreated, or recompiled. Computer software

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

does not include computer data bases or computer software documentation.

(4) "Computer software documentation" means owner's manuals, user's manuals, installation instructions, operating instructions, and other similar items, regardless of storage medium, that explain the capabilities of the computer software or provide instructions for using the software.

(5) "Detailed manufacturing or process data" means technical data that describe the steps, sequences, and conditions of manufacturing, processing or assembly used by the manufacturer to produce an item or component or to perform a process.

(6) "Developed" means that an item, component, or process exists and is workable. Thus, the item or component must have been constructed or the process practiced. Workability is generally established when the item, component, or process has been analyzed or tested sufficiently to demonstrate to reasonable people skilled in the applicable art that there is a high probability that it will operate as intended. Whether, how much, and what type of analysis or testing is required to establish workability depends on the nature of the item, component, or process, and the state of the art. To be considered "developed," the item, component, or process need not be at the stage where it could be offered for sale or sold on the commercial market, nor must the item, component, or process be actually reduced to practice within the meaning of Title 35 of the United States Code.

(7) "Developed exclusively at private expense" means development was accomplished entirely with costs charged to indirect cost pools, costs not allocated to a government contract, or any combination thereof.

(i) Private expense determinations should be made at the lowest practicable level.

(ii) Under fixed-priced contracts, when total costs are greater than the firm-fixed-price or ceiling price of the contract, the additional development costs necessary to complete development shall not be considered when determining whether development was at government, private, or mixed expense.

(8) "Developed exclusively with government funds" means development was not accomplished exclusively or partially at private expense.

(9) "Developed with mixed funding" means development was accomplished partially with costs charged to indirect cost pools and/or costs not allocated to a government contract, and partially with costs charged directly to a government contract.

(10) "Form, fit, and function data" means technical data that describes the required overall physical, functional, and performance characteristics (along with the qualification requirements, if applicable) of an item, component, or process to the extent necessary to permit identification of physically and functionally interchangeable items.

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

(11) "Government purpose" means any activity in which the United States Government is a party, including cooperative agreements with international or multi-national defense organizations, or sales or transfers by the United States Government to foreign governments or international organizations. Government purposes include competitive procurement, but do not include the rights to use, modify, reproduce, release, perform, display, or disclose technical data for commercial purposes or authorize others to do so.

(12) "Government purpose rights" means the right to--

(i) Use, modify, reproduce, release, perform, display, or disclose technical data within the Government without restrictions; and

(ii) Release or disclose technical data outside the Government and authorize persons to whom release or disclosure has been made to use, modify, reproduce, release, perform, display, or disclose that data for United States government purposes.

(13) "Limited rights" means the rights to use, modify, reproduce, release, perform, display, or disclose technical data, in whole or in part, within the Government. The Government may not, without the written permission of the party asserting limited rights, release or disclose the technical data outside the Government, use the technical data for manufacture, or authorize the technical data to be used by another part, except that the Government may reproduce, release or disclose such data or authorize the use or reproduction of the data by persons outside the Government if reproduction, release, disclosure, or use is--

(i) Necessary for emergency repair and overhaul; or

(ii) A release or disclosure of technical data (other than detailed manufacturing or process data) to, or use of such data by, a foreign government that is in the interest of the Government and is required for evaluational or informational purposes;

(iii) Subject to a prohibition on the further reproduction, release, disclosure, or use of the technical data; and

(iv) The contractor or subcontractor asserting the restriction is notified of such reproduction, release, disclosure, or use.

(14) "Technical data" means recorded information, regardless of the form or method of the recording, of a scientific or technical nature (including computer software documentation). The term does not include computer software or data incidental to contract administration, such a financial and/or management information.

(15) "Unlimited rights" means rights to use, modify, reproduce, perform, display, release, or disclose technical data in whole or in part, in any manner, and for any purpose whatsoever, and to have or authorize others to do so.

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

## (b) Rights in technical data.

The Contractor grants or shall obtain for the Government the following royalty free, world-wide, nonexclusive, irrevocable license rights in technical data other than computer software documentation (see Rights in Noncommercial Computer Software and Noncommercial Computer Software Documentation clause of this contract for rights in computer software documentations):

## (1) Unlimited rights.

The Government shall have unlimited rights in technical data that are--

(i) Data pertaining to an item, component, or process which has been or will be developed exclusively with Government funds;

(ii) Studies, analyses, test data, or similar data produced for this contract, when the study, analysis, test, or similar work was specified as an element of performance;

(iii) Created exclusively with Government funds in the performance of a contract that does not require the development, manufacture, construction, or production of items, components, or processes;

(iv) Form, fit, and function data;

(v) Necessary for installation, operation, maintenance, or training purposes (other than detailed manufacturing or process data);

(vi) Corrections or changes to technical data furnished to the Contractor by the Government;

(vii) Otherwise publicly available or have been released or disclosed by the Contractor or subcontractor without restrictions on further use, release or disclosure, other than a release or disclosure resulting from the sale, transfer, or other assignment of interest in the technical data to another party or the sale or transfer of some or all of a business entity or its assets to another party;

(viii) Data in which the Government has obtained unlimited rights under another Government contract or as a result of negotiations; or

(ix) Data furnished to the Government, under this or any other Government contract or subcontract thereunder, with--

(A) Government purpose license rights or limited rights and the restrictive condition(s) has/have expired; or

(B) Government purpose rights and the Contractor's exclusive right to use such data for commercial purposes has expired.

## (2) Government purpose rights.

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

(i) The Government shall have government purpose rights for a five-year period, or such other period as may be negotiated, in technical data--

(A) That pertain to items, components, or processes developed with mixed funding except when the Government is entitled to unlimited rights in such data as provided in paragraphs (b)(ii) and (b)(iv) through (b)(ix) of this clause; or

(B) Created with mixed funding in the performance of a contract that does not require the development, manufacture, construction, or production of items, components, or processes.

(ii) The five-year period, or such other period as may have been negotiated, shall commence upon execution of the contract, subcontract, letter contract (or similar contractual instrument), contract modification, or option exercise that required development of the items, components, or processes or creation of the data described in paragraph (b)(2)(i)(B) of this clause. Upon expiration of the five-year or other negotiated period, the Government shall have unlimited rights in the technical data.

(iii) The Government shall not release or disclose technical data in which it has government purpose rights unless--

(A) Prior to release or disclosure, the intended recipient is subject to the non-disclosure agreement at 227.7103-7 of the Defense Federal Acquisition Regulation Supplement (DFARS); or

(B) The recipient is a Government contractor receiving access to the data for performance of a Government contract that contains the clause at DFARS 252.227-7025, Limitations on the Use or Disclosure of Government-Furnished Information Market with Restrictive Legends.

(iv) The Contractor has the exclusive right, including the right to license others, to use technical data in which the Government has obtained government purpose rights under this contract for any commercial purpose during the time period specified in the government purpose rights legend prescribed in paragraph (f)(2) of this clause.

(3) Limited rights.

(i) Except as provided in paragraphs (b)(1)(ii) and (b)(1)(iv) through (b)(1)(ix) of this clause, the Government shall have limited rights in technical data--

(A) Pertaining to items, components, or processes developed exclusively at private expense and marked with the limited rights legend prescribed in paragraph (f) of this clause; or

(B) Created exclusively at private expense in the performance of a contract that does not require the development, manufacture, construction, or production of items, components, or processes.

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

(ii) The Government shall require a recipient of limited rights data for emergency repair or overhaul to destroy the data and all copies in its possession promptly following completion of the emergency repair/overhaul and to notify the Contractor that the data have been destroyed.

(iii) The Contractor, its subcontractors, and suppliers are not required to provide the Government additional rights to use, modify, reproduce, release, perform, display, or disclose technical furnished to the Government with limited rights. However, if the Government desires to obtain additional rights in technical data in which it has limited rights, the Contractor agrees to promptly enter into negotiations with the Contracting Officer to determine whether there are acceptable terms for transferring such rights. All technical data in which the Contractor has granted the Government additional rights shall be listed or described in a license agreement made part of the contract. the license shall enumerate the additional rights granted the Government in such data.

(4) Specifically negotiated license rights.

The standard license rights granted to the Government under paragraphs (b)(1) through (b)(3) of this clause, including the period during which the Government shall have government purpose rights in technical data, may be modified by mutual agreement to provide such rights as the parties consider appropriate but shall not provide the Government lesser rights than are enumerated in paragraph (a)(13) of this clause. Any rights so negotiated shall be identified in a license agreement made part of this contract.

(5) Prior government rights.

Technical data that will be delivered, furnished, or otherwise provided to the Government under this contract, in which the Government has previously obtained rights shall be delivered, furnished, or provided with the pre-existing rights, unless--

(i) The parties have agreed otherwise; or

(ii) Any restrictions on the Government's rights to use, modify, reproduce, release, perform, display, or disclose the data have expired or no longer apply.

(6) Release from liability.

The Contractor agrees to release the Government from liability for any release or disclosure of technical data made in accordance with paragraph (a)(13) or (b)(2)(iii) of this clause, in accordance with the terms of a license negotiated under paragraph (b)(4) of this clause, or by others to whom the recipient has released or disclosed the data and to seek relief solely from the party who has improperly used, modified, reproduced, released, performed, displayed, or disclosed Contractor data marked with restrictive legends.

(c) Contractor rights in technical data.



## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

All rights not granted to the Government are retained by the Contractor.

(d) Third party copyrighted data.

The Contractor shall not, without the written approval of the Contracting Officer, incorporate any copyrighted data in the technical data to be delivered under this contract unless the Contractor is the copyright owner or has obtained for the Government the license rights necessary to perfect a license or licenses in the deliverable data of the appropriate scope set forth in paragraph (b) of this clause, and has affixed a statement of the license or licenses obtained on behalf of the Government and other persons to the data transmittal document.

(e) Identification and delivery of data to be furnished with restrictions on use, release, or disclosure.

(1) This paragraph does not apply to restrictions based solely on copyright.

(2) Except as provided in paragraph (e)(3) of the clause, technical data that the Contractor asserts should be furnished to the Government with restrictions on use, release, or disclosure are identified in an attachment to this contract (see Attachment). The Contractor shall not deliver any data with restrictive markings unless the data are listed on the Attachment.

(3) In addition to the assertions made in the Attachment, other assertions may be identified after award when based on new information or inadvertent omissions unless the inadvertent omissions would have materially affected the source selection decision. Such identification and assertion shall be submitted to the Contracting Officer as soon as practicable prior to the scheduled date for delivery of the data, in the following format, and signed by an official authorized to contractually obligate the Contractor:

Identification and Assertion of Restrictions on the Government's Use, Release, or Disclosure of Technical Data.

The Contractor asserts for itself, or the persons identified below, that the Government's rights to use, release, or disclose the following technical data should be restricted--

Technical Data to be Furnished With Restrictions*	Asserted Basis for Assertion**	Name of Person Rights Category***	Asserting Restrictions****
(LIST)	(LIST)	(LIST)	(LIST)

\*If the assertion is applicable to items, components, or processes developed at private expense, identify both the data and each such item, component, or process.

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

\*\*Generally, the development of an item, component, or process at private expense, either exclusively or partially, is the only basis for asserting restrictions on the Government's rights to use, release, or disclose technical data pertaining to such terms, components, or processes. Indicate whether development was exclusively or partially at private expense. If development was not at private expense, enter the specific reason for asserting that the Government's right should be restricted.

\*\*\*Enter asserted rights category (e.g. government purpose license rights from a prior contract, rights in SBIR data generated under another contract, limited or government purpose rights under this or a prior contract, or specifically negotiated licenses).

\*\*\*\*Corporation, individual, or other person, as appropriate.

Date \_\_\_\_\_

Printed Name and Title \_\_\_\_\_

Signature \_\_\_\_\_

\_\_\_\_\_  
(End of identification and assertion)

(4) When requested by the Contracting Officer, the Contractor shall provide sufficient information to enable the Contracting Officer to evaluate the Contractor's assertions. The Contracting Officer reserves the right to add the Contractor's assertions to the Attachment and validate any listed assertion, at a later date, in accordance with the procedures of the Validation of Restrictive Markings on Technical Data clause of this contract.

(f) Marking requirements.

The Contractor, and its subcontractor or suppliers, may only assert restrictions on the Government's rights to use, modify, reproduce, release, perform, display, or disclose technical data to be delivered under this contract by marking the deliverable data subject to restriction. Except as provided in paragraph (f)(5) of this clause, only the following legends are authorized under this contract: the government purpose rights legend at paragraph (f)(2) of this clause: the limited rights legend at paragraph (f)(3) of this clause: or the special license rights legend at paragraph (f)(4) of this clause, and/or a notice of copyright as prescribed under 17 U.S.C. 401 or 402.

(1) General marking instructions.

The Contractor, or its subcontractors or suppliers, shall conspicuously and legibly mark the appropriate legend on all technical data that qualify for such markings. The authorized legends shall be placed on the transmittal document or storage container and, for printed material, each page of the printed material containing technical data for which

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

restrictions are asserted. When only portions of a page of printed material are subject to the asserted restrictions, such portions shall be identified by circling, underscoring, with a note, or other appropriate identifier. Technical data transmitted directly from one computer or computer terminal to another shall contain a notice of asserted restrictions. Reproductions of technical data or any portions thereof subject to asserted restrictions shall also reproduce the asserted restrictions.

(2) Government purpose rights markings.

Data delivered or otherwise furnished to the Government with government purpose rights shall be marked as follows:

## GOVERNMENT PURPOSE RIGHTS

Contract No. \_\_\_\_\_

Contractor Name \_\_\_\_\_

Contractor Address \_\_\_\_\_

\_\_\_\_\_

Expiration Date \_\_\_\_\_

The Government's rights to use, modify, reproduce, release, perform, display, or disclose these technical data are restricted by paragraph (b)(2) of the Rights in Technical Data--Noncommercial Items clause contained in the above identified contract. No restrictions apply after the expiration date shown above. Any reproduction of technical data or portions thereof marked with this legend must also reproduce the markings.

(End of legend)

(3) Limited rights markings.

Data delivered or otherwise furnished to the Government with limited rights shall be marked with the following legend:

## LIMITED RIGHTS

Contract No. \_\_\_\_\_

Contractor Name \_\_\_\_\_

Contractor Address \_\_\_\_\_

\_\_\_\_\_

The Government's rights to use, modify, reproduce, release, perform, display, or disclose these technical data are restricted by paragraph (b)(3) of the Rights in Technical Data--Noncommercial Items clause

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

contained in the above identified contract. Any reproduction of technical data or portions thereof marked with this legend must also reproduce the markings. Any person, other than the Government, who has been provided access to such data must promptly notify the above name Contractor.

(End of legend)

(4) Special license rights markings.

(I) Data in which the Government's rights stem from a specifically negotiated license shall be marked with the following legend:

## SPECIAL LICENSE RIGHTS

The Government's rights to use, modify, reproduce, release, perform, display, or disclose these data are restricted by Contract No. \_\_\_\_\_ )Insert contract number) \_\_\_\_\_, License No. \_\_\_\_\_ (Insert license identifier) \_\_\_\_\_. Any reproduction of technical data or portions thereof marked with this legend must also reproduce the markings.

(End of legend)

(ii) For purposes of this clause, special licenses do not include government purpose license rights acquired under a prior contract (see paragraph (b)(5) of this clause)\_.

(5) Pre-existing data markings.

If the terms of a prior contract or license permitted the Contractor to restrict the Government's rights to use, modify, reproduce, release perform, display, or disclose technical data deliverable under this contract, and those restrictions are still applicable, the Contractor may mark such data with the appropriate restrictive legend for which the data qualified under the prior contract or license. The marking procedures in paragraph (f)(1) of this clause shall be followed.

(g) Contractor procedures and records.

Throughout performance of this contract, the Contractor and its subcontractors or suppliers that will deliver technical data with other than unlimited rights, shall--

(1) Have, maintain, and follow written procedures sufficient to assure that restrictive markings are used only when authorized by the terms of this clause, and

(2) Maintain records sufficient to justify the validity of any restrictive markings on technical data delivered under this contract.

(h) Removal of unjustified and nonconforming markings.

(1) Unjustified technical data markings.

The rights and obligations of the parties regarding the validation of restrictive markings or technical data furnished or to be furnished under this contract are contained in the Validation of Restrictive Markings on Technical Data clause of this contract. Notwithstanding any provision of this contract concerning inspection and acceptance, the Government may ignore or, at the Contractor's expense, correct or strike a marking if, in accordance with the procedures in the Validation of Restrictive Markings on Technical Data clause of this contract, a restrictive marking is determined to be unjustified.

(2) Nonconforming technical data markings.

A nonconforming marking is a marking placed on technical data delivered or otherwise furnished to the Government under this contract that is not in the format authorized by this contract. Correction of nonconforming markings is not subject to the Validation of Restrictive Markings on Technical Data clause of this contract. If the Contracting Officer notifies the Contractor of a nonconforming marking and the Contractor fails to remove or correct such marking within sixty (60) days, the Government may ignore or, at the Contractor's expense, remove or correct any nonconforming marking.

(I) Relation to patents.

Nothing contained in this clause shall imply a license to the Government under any patent or be construed as affecting the scope of any license or other with otherwise granted to the Government under any patent.

(j) Limitation on charges for rights in technical data.

(1) The Contractor shall not charge to this contract any cost, including, but not limited to, license fees, royalties, or similar charges, for rights in technical data to be delivered under this contract when--

(I) The Government has acquired, by any means, the same or greater rights in the data; or

(ii) The data are available to the public without restrictions.

(2) The limitation in paragraph (j)(1) of this clause--

(I) Includes costs charged by a subcontractor or supplier, at any tier, or costs incurred by the Contractor to acquire rights in subcontractor or supplier technical data, if the subcontractor or supplier has been paid for such rights under any other Government contract or under a license conveying the rights to the Government; and

(ii) Does not include the reasonable costs of reproducing, handling, or mailing the documents or other media in which the technical data will be delivered.

(k) Applicability to subcontractors or suppliers.

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

(1) The Contractor shall ensure that the rights afforded its subcontractors and suppliers under 10 U.S.C. 2320, 10 U.S.C. 2321, and the identification, assertion, and delivery processes of paragraph (e) of this clause are recognized and protected.

(2) Whenever any technical data for noncommercial items is to be obtained from a subcontractor or supplier for delivery to the Government under this contract, the Contractor shall use this same clause in the subcontract or other contractual instrument, and require its subcontractors or suppliers to do so, without alteration, except to identify the parties. No other clause shall be used to enlarge or diminish the Government's, the Contractor's, or a higher-tier subcontractor's or supplier's rights in a subcontractor's or supplier's technical data.

(3) Technical data required to be delivered by a subcontractor or supplier shall normally be delivered to the next higher-tier contractor, subcontractor, or supplier. However, when there is a requirement in the prime contract for data which may be submitted with other than unlimited rights by a subcontractor or supplier, then said subcontractor or supplier may fulfill its requirement by submitting such data directly to the Government, rather than through a higher-tier contractor, subcontractor, or supplier.

(4) The Contractor and higher-tier subcontractors or suppliers shall not use their power to award contracts as economic leverage to obtain rights in technical data from their subcontractors or suppliers.

(5) In no event shall the Contractor use its obligation to recognize and protect subcontractor or supplier rights in technical data as an excuse for failing to satisfy its contractual obligation to the Government.

1.54 LIMITATIONS ON THE USE OR DISCLOSURE OF GOVERNMENT-FURNISHED  
INFORMATION MARKED WITH RESTRICTIVE LEGEND DFARS 252.227-7025 (JUN 1995)  
2 January 1996

(a)(1) For contracts requiring the delivery of technical data, the terms, "limited rights" and "Government purpose rights" are defined in the Rights in Technical Data--Noncommercial Items clause of this contract.

(2) For contracts that do not require the delivery of technical data, the terms "government purpose rights" and "restricted rights" are defined in the Rights in Noncommercial Computer Software and Noncommercial Computer Software Documentation clause of this contract.

(3) For Small Business Innovative Research program contracts, the terms "limited rights" and "restricted rights" are defined in the Rights in Noncommercial Technical Data and Computer Software--Small Business Innovative Research (SBIR) Program clause of this contract.

(b) Technical data or computer software provided to the Contractor as Government furnished information (GFI) under this contract may be subject to restrictions on use, modification, reproduction, release, performance, display, or further disclosure.

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

- (1) GFI marked with limited or restricted rights legends.

The Contractor shall use, modify, reproduce, perform, or display technical data received from the Government with limited rights legends or computer software received with restricted rights legends only in the performance of this contract. The Contractor shall not, without the express written permission of the party whose name appears in the legend, release or disclose such data or software to any person.

- (2) GFI marked with government purpose rights legends.

The Contractor shall use technical data or computer software received from the Government with government purpose rights legends for government purposes only. The Contractor shall not, without the express written permission of the party whose name appears in the restrictive legend, use, modify, reproduce, release, perform, or display such data or software for any commercial purpose or disclose such data or software to a person other than its subcontractors, suppliers, or prospective subcontractors or suppliers, who require the data or software to submit offers for, or perform, contracts under this contract. Prior to disclosing the data or software, the Contractor shall require the persons to whom disclosure will be made to complete and sign the non-disclosure agreement at 227.7103-7 of the Defense Federal Acquisition Regulation Supplement (DFARS).

- (3) GFI marked with specially negotiated license rights legends.

The Contractor shall use, modify, reproduce, release, perform, or display technical data or computer software received from the Government with specially negotiated license legends only as permitted in the license.

Such data or software may not be release or disclosed to other persons unless permitted by the license and, prior to release or disclosure, the intended recipient has completed the non-disclosure agreement at DFARS 227.7103-7. The Contractor shall modify paragraph (1)(c) of the non-disclosure agreement to reflect the recipient's obligations regarding use, modification, reproduction, release, performance, display, and disclosure of the data of software.

- (c) Indemnification and creation of third party beneficiary rights.

The Contractor agrees--

(1) To indemnify and hold harmless the Government, its agents, and employees from every claim or liability, including attorneys fees, court costs, and expenses, arising out of, or in any way related to, the misuse or unauthorized modification, reproduction, release, performance, display, or disclosure of technical data or computer software received from the Government with restrictive legends by the Contractor or any person to whom the Contractor has released or disclosed such data or software; and

(2) That the party whose name appears on the restrictive legend, in addition to any other rights it may have, is a third party beneficiary who has the right of direct action against the Contractor, or any person to whom the Contractor has released or disclosed such data or software, for

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

the unauthorized duplication, release, or disclosure of technical data or computer software subject to restrictive legends.

## 1.55 NOT USED (FIRMER APPLICABILITY)

1.56 VARIATIONS IN ESTIMATED QUANTITIES - SUBDIVIDED ITEMS (MAR 1995)  
EFARS 52.212-5001.  
2 Jan 1996

The variation in Estimated Quantities clause is applicable only to Items Nos. 44 and 45.

(a) Variation from the estimated quantity in the actual work performed under any second or subsequent sub-item or elimination of all work under such a second or subsequent sub-item will not be the basis for an adjustment in contract unit price.

(b) Where the actual quantity of work performed for Items Nos. less than 85% of the quantity of the first sub-item listed under such item, the contractor will be paid at the contract unit price for that sub-item for the actual quantity of work performed and, in addition, an equitable adjustment shall be made in accordance with the clause FAR 52.212-11, Variation in Estimated Quantities.

(c) If the quantity of work performed under Items Nos. exceeds 115% or is less than 85% of the total estimated quantity of the sub-items under that item, and/or if the quantity of work performed under the second sub-item or any subsequent sub-item under Items Nos. exceeds 115% or is less than 85% of the estimated quantity of any such sub-item, and if such variation causes an increase or a decrease in the time required for performance of this contract the contract completion time will be adjusted in accordance with the clause FAR 52.212-11, Variation in Estimated Quantities.

1.57 PARTNERING  
August 1996

In order to most effectively accomplish this contract, the Government proposes to form a partnership with the Contractor to develop a cohesive building team. It is anticipated that this partnership would involve the Corps of Engineers, the Contractor, and key representatives to include subcontractors, the designers, and local community representatives. This partnership would strive to develop a cooperative management team drawing on the strengths of each team member in an effort to achieve a quality project within budget and on schedule. This partnership would be bilateral in membership and participation will be totally voluntary. It is anticipated that partnering meetings would be held every 6 months at a minimum. All costs, excluding labor and travel expenses, shall be shared equally between the Government and the Contractor. The Contractor and Government shall be responsible for their own labor and travel costs.

## 1.58 NOT USED



## 1.59 NOT USED (CONSTRUCTION AND DEMOLITION (C&amp;D) WASTE MANAGEMENT PLAN)

Refer to SECTION 01410, ENVIRONMENT PROTECTION for CDD waste management requirements.

1.60 DAMAGE TO WORK (ORL)  
15 JUNE 1990

The responsibility for damage to any part of the work to be performed under this contract shall be as set forth in the CONTRACT CLAUSE: PERMITS AND RESPONSIBILITIES. However, if in the judgement of the Contracting Officer, any part of the permanent work performed by the Contractor is damaged by flood or earthquake or the cofferdam is overtopped by flood and such flood causes damage to the cofferdam, which damage is not due to the failure of the Contractor to take reasonable precaution or to exercise sound engineering and construction practices in the conduct of the work, the Contractor will make the repairs ordered by the Contracting Officer and full compensation for such repairs will be made at the applicable contract unit or lump sum prices as fixed and established in the contract. If, in the opinion of the Contracting Officer, there are no contract unit or lump sum prices applicable to any part of such damaged work, an equitable adjustment pursuant to CONTRACT CLAUSE: CHANGES will be made as full compensation therefor.

The Contractor may, subject to the approval of the Contracting Officer, or the Contracting Officer may order the Contractor to flood or breach the cofferdam during a rise prior to, and in anticipation of, natural flooding due to overtopping. Such flooding or breach will be considered the same as though the cofferdam, if constructed in accordance with plans and progress schedules approved by the Contracting Officer, had been overtopped, in which event an equitable adjustment will be made for damages to the cofferdam and/or any part of the permanent work, as provided in the paragraph above.

1.61 CONTINUING CONTRACTS (MAR 1995) EFARS 52.232-5001.  
2 January 1996

a. This is a continuing contract, as authorized by Section 10 of the River and Harbor Act of September 22, 1922 (33 U.S. Code 621). The payment of some portion of the contract price is dependent upon reservations of funds from future appropriations, and from future contribution to the project having one or more non-federal project sponsors. The responsibilities of the Government are limited by this clause notwithstanding any contrary provision of the "Payments to Contractor" clause or any other clause of this contract.

b. The sum of \$1,000,000 has been reserved for this contract and is available for payments to the Contractor during the current fiscal year. It is expected that Congress will make appropriations for future fiscal years from which additional funds together with funds provided by one or more non-federal project sponsors will be reserved for this contract.

c. Failure to make payments in excess of the amount currently reserved, or that may be reserved from time to time, shall not entitle the Contractor to a price adjustment under the terms of this contract except as specifically provided in paragraphs 24.6 and 24.9 below. No such failure shall constitute a breach of this contract, except that this provision shall not bar a breach-of-contract action if an amount finally determined to be due as a termination allowance remains unpaid for one year due solely to a failure to reserve sufficient additional funds therefore.

d. The Government may at any time reserve additional funds for payments under the contract if there are funds available for such purpose. The Contracting Officer will promptly notify the Contractor of any additional funds reserved for the contract by issuing an administrative modification to the contract.

e. If earnings will be such that funds reserved for the contract will be exhausted before the end of any fiscal year, the Contractor shall give written notice to the Contracting Officer of the estimated date of exhaustion and the amount of additional funds which will be needed to meet payments due or to become due under the contract during that fiscal year. This notice shall be given not less than 45 nor more than 60 days prior to the estimated date of exhaustion.

f. No payments will be made after exhaustion of funds except to the extent that additional funds are reserved for the contract. The Contractor shall be entitled to simple interest on any payment that the Contracting Officer determines was actually earned under the terms of the contract and would have been made except for exhaustion of funds. Interest shall be computed from the time such payment would otherwise have been made until actually or constructively made, and shall be at the rate established by the Secretary of the Treasury pursuant to Public Law 92-41, 85 STAT 97, as in effect on the first day of the delay in such payment.

g. Any suspension, delay, or interruption of work arising from exhaustion or anticipated exhaustion of funds shall not constitute a breach of this contract and shall not entitle the Contractor to any price adjustment under CONTRACT CLAUSE: SUSPENSION OF WORK or in any other manner under this contract.

h. An equitable adjustment in performance time shall be made for any increase in the time required for performance of any part of the work arising from exhaustion of funds or the reasonable anticipation of exhaustion of funds.

i. If, upon the expiration of 60 days after the beginning of the fiscal year following an exhaustion of funds, the Government has failed to reserve sufficient additional funds to cover payments otherwise due, the Contractor, by written notice delivered to the Contracting Officer at any time before such additional funds are reserved, may elect to treat his right to proceed with the work as having been terminated. Such a termination shall be considered a termination for the convenience of the Government.

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

j. If at any time it becomes apparent that the funds reserved for any fiscal year are in excess of the funds required to meet all payments due or to become due the Contractor because of work performed and to be performed under the contract during the fiscal year, the Government reserves the right, after notice to the Contractor, to reduce said reservation by the amount of such excess.

1.62 OBSTRUCTION OF NAVIGABLE WATERWAYS (DEC 1991) DFARS 252.236-7002.  
24 February 1992

a. The Contractor shall--

(1) Promptly recover and remove any material, plant, machinery, or appliance which the Contractor loses, dumps, throws overboard, sinks, or misplaces, and which, in the opinion of the Contracting Officer, may be dangerous to or obstruct navigation;

(2) Give immediate notice, with description and locations of any such obstructions until the same are removed.

(3) When required by the Contracting Officer, mark or buoy such obstructions until the same are removed.

b. The Contracting Officer may--

(1) Remove the obstructions by contract or otherwise should the Contractor refuse, neglect, or delay compliance with paragraph a. above of this clause; and

(2) Deduct the cost of removal from any monies due or to become due to the Contractor; or

(3) Recover the cost of removal under the Contractor's bond.

c. The Contractor's liability for the removal of a vessel wrecked or sunk without fault or negligence is limited to that provided in Sections 15, 19, and 20 of River and Harbor Act of March 3, 1899 (33 U.S.C. 410 et seq.).

d. The Government will maintain normal lock operations at McAlpine Locks during the contract period. The Contractor shall not obstruct navigation through the 1200-foot lock at any time. Over the last 10 years, the 1200-foot lock has been operated an average of 20 times per day. Contractor vessels will not have priority over commercial traffic in lock operations.

e. Within 30 days of Notice to Proceed, the Contractor shall submit to the Contracting Officer for approval his plan for maintaining normal navigation at McAlpine Locks. The plan shall describe all measures to be taken by the Contractor to ensure that construction activities do not obstruct navigation.

f. The Contractor shall provide a helper boat to aid navigation at

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

the downstream approach of the 1200-foot lock during the demolition of downstream cofferdam cells (to include the removal of the entire cell, cell fill, and berm material) no. 9.5, 10, 11, and 12, and the connecting arcs between cells 10 and 11 and cells 11 and 12. The helper boat will be required 24 hours a day until this portion of the demolition is complete. The helper boat shall have a minimum of 800 horsepower. No separate payment shall be made for this work. All costs for this work shall be a subsidiary obligation of the contractor.

## 1.63 SIGNAL LIGHTS

15 June 1990

The Contractor shall display signal lights and conduct his operations in accordance with the General Regulations of the Department of the Army and of the Coast Guard governing lights and day signals to be displayed by towing vessels with tows on which no signals can be displayed, vessels working on wrecks, dredges and vessels engaged in laying cables or pipe or in submarine or bank protection operations, lights to be displayed on dredge pipe lines, and day signals to be displayed by vessels of more than 65 feet in length moored or anchored in a fairway or channel, and the passing by other vessels of floating plant working in navigable channels, as set forth in Commandant U.S. Coast Guard Instruction M16672.2, Navigation Rules: International-Inland (Comdtinst M16672.2), or 33 CFR81 Appendix A (International) and 33 CFR 84 through 33 CFR 89 (Inland) as applicable.

1.64 NOT USED (LAKE OPERATION)

1.65 NOT USED (PROPOSED BETTERMENTS)

1.66 NOT USED (SEQUENCE OF DESIGN/CONSTRUCTION)

1.67 NOT USED (SEQUENCE OF DESIGN/CONSTRUCTION)

1.68 NOT USED (DESIGN RESPONSIBILITY OF THE DESIGN/BUILD CONTRACTOR)

1.69 NOT USED (KEY PERSONNEL, SUBCONTRACTORS AND OUTSIDE ASSOCIATES OR CONSULTANTS)

1.70 NOT USED (REQUIREMENTS FOR REGISTRATION OF DESIGNERS)

1.71 NOT USED (DESIGN/BUILD CONTRACT - ORDER OF PRECEDENCE)

1.72 NOT USED (DESIGN CONFERENCES)

1.73 POLLUTION PREVENTION PLAN

In accordance with the Kentucky Pollutant Discharge Elimination System (KPDES) permit, a Storm Water Pollution Prevention Plan (SWPPP) has been developed for this project. This plan has been developed to meet the erosion and sediment control requirements for the Commonwealth of Kentucky.

The SWPPP will be provided to the Contractor as a separate document for use by any State inspectors. The Contractor will implement the SWPPP as shown on the plans, and as directed in these specifications. A Notice of

Intent (NOI) will be prepared by the U. S. Army Corps of Engineers and submitted to the Commonwealth of Kentucky. Commencement of any construction activity (ground disturbing activity) by the Contractor shall not begin until 48 hours after the NOI has been postmarked. The Contractor shall maintain copies of the KPDES permit and SWPPP in the construction trailer on site. Any changes made to the SWPPP must be documented and approved by the Contracting Officer. The Contractor shall refer also to Sections 01356 Storm Water Pollution Prevention Measures and 01410 Environment Protection for additional requirements pertaining to KPDES and storm water pollution prevention requirements. Upon project completion, A Notice of Termination (NOT) will be prepared by the U. S. Army Corps of Engineers and submitted to the Commonwealth of Kentucky.

#### 1.74 WORK COORDINATION

It will be necessary to closely coordinate Contractor work and local operations with the Corps of Engineers, the public, LG&E Hydropower Plant personnel, and other Corps of Engineers contractors. The Contractor shall participate in local information and coordination conferences to outline on-going and projected work. The frequency of these meetings will be determined by the Contracting Officer dependent on the scope and complexity of work, types of local operations, and potential impacts. As a minimum, these coordination meetings will be held weekly. The Contractor's Representative shall be sufficiently knowledgeable of the overall project work and scheduling of the prime and subcontractors' work to participate effectively in these meetings. Any agreements with other contractors shall be subject to the conditions of both contractors and to Government approval. Any activity which may impact others shall be fully coordinated, and additional work as necessary shall be performed to avoid impact.

#### 1.75 INDEFINITE QUANTITIES

The quantities for the Bid Items entitled "Flooding Lost Time" and "Allowance for Flooding and Evacuation" are indefinite quantities. The indicated quantities will be used for bid evaluation purposes only. Quantities paid for will be determined in the event flood emergencies occur. The Government makes no representation as to the quantity required, and no minimum or maximum quantities are guaranteed. The quantities indicated are not subject to adjustment due to the over run, under run, or non-use. No payment will be made for the Bid Items listed above unless a flood emergency necessitates the specified implementing directives.

#### 1.76 SAFETY ENGINEER REQUIREMENT

The Contractor shall identify a full time Safety Engineer for each shift on this project, and their qualifications must be submitted to the Government for acceptance. These individuals shall be employed by the prime contractor, be members of the onsite work organization and be responsible for overall management of the safety and occupational health program, with authority to act in all safety matters for the Contractor. Copies of the letters to the Safety Engineers signed by an authorized official of the firm describing responsibilities and delegating authority to stop work when safety or occupational health of workers is compromised must be provided to

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

the Government as part of the Accident Prevention Plan. The Safety Engineers shall be individuals having 10 years of previous construction safety experience and shall be assigned no other duties. The Contractor must show evidence that these individuals have completed OSHA training, and are trained in First Aid and CPR. An alternate for each Safety Engineer shall be identified in the event of a Safety Engineer's absence. The qualifications for the alternate shall be similar as for the Safety Engineer and accepted by the Contracting Officer.

Acceptance of the Contractor's Safety Engineers is required prior to the start of construction. Acceptance is conditional and will be predicated on satisfactory performance during construction. The Government reserves the right to require the Contractor to make changes to operations including removal of personnel, as necessary, to obtain a safe work site. At no time will the job be permitted to operate without a full time Safety Engineer on duty at the work site.

Duties of the Safety Engineers shall include, as a minimum, the following: prepare the contractor's Accident Prevention Plan and Activity Hazard Analysis for each definable feature of work; provide safety indoctrination to all construction workers and site visitors to include personnel performing maintenance of equipment; ensure the Contractor's accepted Accident Prevention Plan is carried out; ensure that all contractor/subcontractor employees have all HTRW, asbestos, and lead paint training as appropriate, and that their personnel protection equipment meets applicable OSHA/ EPA requirements; conduct daily walk through of the site ensuring work is being accomplished safely and occupational health is not compromised; attend and participate in all preparatory and initial quality control phase meetings; conduct weekly safety meetings for all workers; conduct monthly supervisory safety meetings; provide accident reports; produce a Daily Safety Report of activities performed and attach this report to the Contractor's Quality Control Report. Minutes shall be provided of weekly and monthly safety meetings with the Daily Safety Report.

#### 1.77 SAFETY INCENTIVE CLAUSE

The Contractor shall provide a plan to encourage all employees to work safely. This plan shall be directed at the individual employee and shall be so designed such that it motivates all employees toward a safe work attitude. The plan shall be designed to be a positive incentive plan and must include a tangible reward and benefit to the individual employee during the physical, construction work on site. The reward frequency shall be at least once a month. This "Work Safety Incentive Plan" must be integrated into the overall "Accident Prevention Plan" which must be approved prior to start of construction. The "Work Safety Incentive Plan" shall indicate who will administer the program and provide discrete details on how it will be administered.

#### 1.78 COFFERDAM EVACUATION REQUIREMENTS

Prior to commencing work in the dewatered cofferdam area, the Contractor shall implement the approved evacuation plan. The Contractor shall submit to the Contracting Officer for approval his plan for evacuation of the dewatered cofferdam area. The plan shall include circumstances under which

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

the system would be activated, plan for activation, etc. The plan shall be in accordance with the requirements of EM 385-1-1. The plan shall contain the following in addition to the requirements of EM 385-1-1:

- (a) Chain of supervision for evacuation activities.
- (b) Method for accountability of personnel.
- (c) Means for notifying personnel unable to hear alarm horns.
- (d) Means for activating alarm and station locations.
- (e) Emergency egress routes.

The system shall include, as a minimum, the following items:

a. Emergency Alarm System. The system provided as Government-furnished property provides manual stations for activating the alarm, both in the work area and on top of the cofferdam. The alarm system shall be operated and maintained by the Contractor. The Contractor shall ensure that the alarm provides a distinctive sound audible above the highest anticipated background noise, including heavy equipment operations, throughout the work area within the cofferdam area. The alarm shall be activated for a test both from the work area and from the top of the cofferdam once each month. A provision of the evacuation plan shall include a means for alerting personnel who are unable to hear the alarm.

b. Radio and Powered Megaphones. There shall be adequate radio communications between supervisors both within and outside of the cofferdam area, and in addition, with each work crew and crane operator. Powered megaphones (bullhorns) shall be provided and shall be available (one at each stairway) to relay verbal instructions to workmen within the area.

c. Personnel Stairs and Ladders. Stairs extending from the top of the cofferdam to the working floor are provided. The stair towers are to be used for emergencies only. Landings at the top and at the bottom of the stairs, and intermediate landings, shall be kept free from debris and be well lighted. Adequate stair ramps with guardrails shall be provided on steep slopes and/or loose material where required for safe egress from excavations. Each cofferdam exit stairway shall be kept open until the cofferdam is rewatered. When construction activities interfere with the location of a stairway, the Contractor shall maintain an exit way at the same general location, either around or up and over the construction activity in a manner that maintains the current distance between exit ways at all times during construction. The number and spacing of the stairtowers along the 600 south wall shall remain as shown and will require modification to remain in service during construction of the new 1200-foot lock south wall. All stairtowers and ramps shall be in accordance with EM 385-1-1. The Contractor's plan for altering any exit ways due to construction interference shall be submitted for Government Approval.

d. Skiffs. Two safety skiffs meeting requirements of EM 385-1-1 shall be required within the cofferdam area for emergency use.

e. Life Rings. Life rings shall be placed and maintained 100 feet apart on the outside of the cofferdam and inside near exits and work areas.

f. Lights. Proper lighting shall be provided of exit areas when night work is performed.

g. General. All of the above items shall be checked periodically to assure that they are in good working order. The period of all inspections shall be included in the evacuation plan and a means of documentation of inspections shall be included. All employees shall be instructed in the emergency escape routes, procedures, and signals to be used. Emergency signals should be understood prior to beginning site work and should be distinct from ordinary communication signals. When changing conditions warrant, instructions shall be given as required to keep all personnel current. Additional details concerning the cofferdam can be found in specification section 02170 COFFERDAM.

#### 1.79 LIGHTNING DETECTION SYSTEM

The Contractor shall provide and install a lightning detection system for use during the course of construction for the project. The system shall be capable of monitoring actual strikes up to a minimum of 100 miles away and shall be able to detect strikes and sound an alarm when lightning is detected in the local area. The alarm shall be audible to all workers on the site. The Contractor shall develop a plan for seeking shelter and resuming work in case of an alarm. The plan shall also describe the location of the detector, local alarm distance, local alarm clear distance, and shelter location. This plan shall be incorporated into the Contractor's Accident Prevention Plan, and submitted for Government Approval.

#### 1.80 PUBLIC MEETINGS

The Contractor's senior person on site will be required to participate in public meetings once a month. The Contractor's blaster in charge and seismic specialist will be required to participate in the public meetings once a month during the time periods when there is blasting taking place on the project. Representatives of the Corps of Engineers will also be present at these public meetings.

#### 1.81 ADDITIONAL SAFETY REQUIREMENTS

Welding and hot work is prohibited within 100 feet of a red flag barge. Any welding or hot work occurring on a lock wall shall cease when a red flag barge enters the lock chamber and shall not commence until the barge has completely exited the lock chamber.

#### 1.82 INSPECTION FACILITIES

In order to facilitate inspection, the Contractor will be required, without additional cost, to furnish the following items:

(a) To furnish, on the request of the Contracting Officer or Government inspector, the use of such boats, boatmen, scales, equipment and crew of the plant as may be reasonably necessary in inspecting and supervising the work.



## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

(b) To furnish, on the request of the Contracting Officer or Government inspector, suitable transportation from all points on shore designated by the Contracting Officer to and from various pieces of the plant.

Should the Contractor refuse, neglect, or delay compliance with these requirements, the specific facilities may be furnished and maintained by the Contracting Officer, and the cost therefore will be deducted from any amount due or become due to the Contractor.

#### 1.83 PRESERVATION AND RECOVERY OF HISTORICAL, ARCHAEOLOGICAL, AND CULTURAL RESOURCES

District personnel have appropriately addressed known historical, archaeological and cultural resources discovered within the Contractor's work area. There are currently no known areas of cultural resource concern that need to be identified for the Contractor. If, however, during construction activities the Contractor observes unusual areas or items that might have historical or archaeological importance, work should stop in this area and the Contracting Officer should immediately be notified. The Contracting Officer will evaluate such observations as soon as practicable.

Guidelines for recording and preservation of historical and archaeological finds during construction activities are specified in 36 CFR 800.

#### 1.84 SCHEDULED PRE-PROPOSAL SITE VISIT MEETING

- The Pre-proposal Site Meeting scheduled for 17 April 2002 will begin at the Louisville Repair Station training room on Shippingport Island at 8:00 a.m. A short presentation and sign-in will be followed by a tour of the site. People interested in visiting the site must RSVP to the McAlpine Resident Engineer Office at (502)772-3492. It should be noted that the tour will be conducted on foot and will last approximately two hours. **Hard hats, safety shoes, and safety glasses must be worn at all times during the tour and should be brought by the Contractor.** Contractors are requested to submit (in writing) any anticipated questions during the 8:00 a.m. sign-in to help facilitate answers at the 11:00 meeting. The Pre-proposal Site Meeting will be followed by a Networking & Marketing Opportunity Program, which will be held at the Romano L. Mazzoli Federal Building Cafeteria from 1:00 to 4:00 p.m. An agenda for the Pre-proposal Site Meeting follows.

##### AGENDA FOR PRE-PROPOSAL SITE MEETING

8:00 Meet at Louisville Repair Station Training Room  
9:00 Tour of Site  
11:00 Meet at Louisville Repair Station Training Room for Briefing/Q&A  
12:00 Adjourn

#### PART 2 PRODUCTS NOT

SECTION TABLE OF CONTENTS

DIVISION 01 - GENERAL REQUIREMENTS

SECTION 01312

QUALITY CONTROL SYSTEM (QCS)

08/01

- 1.1 GENERAL
  - 1.1.1 Correspondence and Electronic Communications
  - 1.1.2 Other Factors
- 1.2 QCS SOFTWARE
- 1.3 SYSTEM REQUIREMENTS
- 1.4 RELATED INFORMATION
  - 1.4.1 QCS User Guide
  - 1.4.2 Contractor Quality Control(CQC) Training
- 1.5 CONTRACT DATABASE
- 1.6 DATABASE MAINTENANCE
  - 1.6.1 Administration
    - 1.6.1.1 Contractor Information
    - 1.6.1.2 Subcontractor Information
    - 1.6.1.3 Correspondence
    - 1.6.1.4 Equipment
    - 1.6.1.5 Management Reporting
  - 1.6.2 Finances
    - 1.6.2.1 Pay Activity Data
    - 1.6.2.2 Payment Requests
  - 1.6.3 Quality Control (QC)
    - 1.6.3.1 Daily Contractor Quality Control (CQC) Reports.
    - 1.6.3.2 Deficiency Tracking.
    - 1.6.3.3 Three-Phase Control Meetings
    - 1.6.3.4 Accident/Safety Tracking.
    - 1.6.3.5 Features of Work
    - 1.6.3.6 QC Requirements
  - 1.6.4 Submittal Management
  - 1.6.5 Schedule
  - 1.6.6 Import/Export of Data
- 1.7 IMPLEMENTATION
- 1.8 DATA SUBMISSION VIA COMPUTER DISKETTE OR CD-ROM
  - 1.8.1 File Medium
  - 1.8.2 Disk or CD-ROM Labels
  - 1.8.3 File Names
- 1.9 MONTHLY COORDINATION MEETING
- 1.10 NOTIFICATION OF NONCOMPLIANCE

-- End of Section Table of Contents --

## SECTION 01312

## QUALITY CONTROL SYSTEM (QCS)

08/01

## 1.1 GENERAL

The Government will use the Resident Management System for Windows (RMS) to assist in its monitoring and administration of this contract. The Contractor shall use the Government-furnished Construction Contractor Module of RMS, referred to as QCS, to record, maintain, and submit various information throughout the contract period. This joint Government-Contractor use of RMS and QCS will facilitate electronic exchange of information and overall management of the contract. QCS provides the means for the Contractor to input, track, and electronically share information with the Government in the following areas:

- Administration
- Finances
- Quality Control
- Submittal Monitoring
- Scheduling
- Import/Export of Data

## 1.1.1 Correspondence and Electronic Communications

For ease and speed of communications, both Government and Contractor will, to the maximum extent feasible, exchange correspondence and other documents in electronic format. Correspondence, pay requests and other documents comprising the official contract record shall also be provided in paper format, with signatures and dates where necessary. Paper documents will govern, in the event of discrepancy with the electronic version.

## 1.1.2 Other Factors

**\*1**

Particular attention is directed to Contract Clause, "Schedules for Construction Contracts", Contract Clause, "**Payments Under Fixed-Price Construction Contracts**", Section 01320, PROJECT SCHEDULE, Section 01335, SUBMITTAL PROCEDURES, and Section 01451, CONTRACTOR QUALITY CONTROL, which have a direct relationship to the reporting to be accomplished through QCS.

Also, there is no separate payment for establishing and maintaining the QCS database; all costs associated therewith shall be included in the contract pricing for the work.

**\*1**

## 1.2 QCS SOFTWARE

QCS is a Windows-based program that can be run on a stand-alone personal computer or on a network. The Government will make available the QCS software to the Contractor after award of the construction contract. Prior to the Pre-Construction Conference, the Contractor shall be responsible to

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

download, install and use the latest version of the QCS software from the Government's RMS Internet Website. Upon specific justification and request by the Contractor, the Government can provide QCS on 3-1/2 inch high-density diskettes or CD-ROM. Any program updates of QCS will be made available to the Contractor via the Government RMS Website as they become available.

### 1.3 SYSTEM REQUIREMENTS

The following listed hardware and software is the minimum system configuration that the Contractor shall have to run QCS:

#### **Hardware**

IBM-compatible PC with 200 MHz Pentium or higher processor

32+ MB RAM

4 GB hard drive disk space for sole use by the QCS system

3 1/2 inch high-density floppy drive

Compact disk (CD) Reader

Color monitor

Laser printer compatible with HP LaserJet III or better, with minimum 4 MB installed memory.

Connection to the Internet, minimum 28 BPS

#### **Software**

MS Windows 95 or newer version operating system (MS Windows NT 4.0 or newer is recommended)

Word Processing software compatible with MS Word 97 or newer

Internet browser

The Contractor's computer system shall be protected by virus protection software that is regularly upgraded with all issued manufacturer's updates throughout the life of the contract.

Electronic mail (E-mail) compatible with MS Outlook

### 1.4 RELATED INFORMATION

#### 1.4.1 QCS User Guide

After contract award, the Contractor shall download instructions for the installation and use of QCS from the Government RMS Internet Website; the Contractor can obtain the current address from the Government. In case of

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

justifiable difficulties, the Government will provide the Contractor with a CD-ROM containing these instructions.

#### 1.4.2 Contractor Quality Control(CQC) Training

The use of QCS will be discussed with the Contractor's QC System Manager during the mandatory CQC Training class.

### 1.5 CONTRACT DATABASE

Prior to the pre-construction conference, the Government shall provide the Contractor with basic contract award data to use for QCS. The Government will provide data updates to the Contractor as needed, generally by files attached to E-mail. These updates will generally consist of submittal reviews, correspondence status, QA comments, and other administrative and QA data.

### 1.6 DATABASE MAINTENANCE

The Contractor shall establish, maintain, and update data for the contract in the QCS database throughout the duration of the contract. The Contractor shall establish and maintain the QCS database at the Contractor's site office. Data updates to the Government shall be submitted by E-mail with file attachments, e.g., daily reports, schedule updates, payment requests. If permitted by the Contracting Officer, a data diskette or CD-ROM may be used instead of E-mail (see Paragraph DATA SUBMISSION VIA COMPUTER DISKETTE OR CD-ROM). The QCS database typically shall include current data on the following items:

#### 1.6.1 Administration

##### 1.6.1.1 Contractor Information

The database shall contain the Contractor's name, address, telephone numbers, management staff, and other required items. Within 14 calendar days of receipt of QCS software from the Government, the Contractor shall deliver Contractor administrative data in electronic format via E-mail.

##### 1.6.1.2 Subcontractor Information

The database shall contain the name, trade, address, phone numbers, and other required information for all subcontractors. A subcontractor must be listed separately for each trade to be performed. Each subcontractor/trade shall be assigned a unique Responsibility Code, provided in QCS. Within 14 calendar days of receipt of QCS software from the Government, the Contractor shall deliver subcontractor administrative data in electronic format via E-mail.

##### 1.6.1.3 Correspondence

All Contractor correspondence to the Government shall be identified with a serial number. Correspondence initiated by the Contractor's site office

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

shall be prefixed with "S". Letters initiated by the Contractor's home (main) office shall be prefixed with "H". Letters shall be numbered starting from 0001. (e.g., H-0001 or S-0001). The Government's letters to the Contractor will be prefixed with "C".

#### 1.6.1.4 Equipment

The Contractor's QCS database shall contain a current list of equipment planned for use or being used on the jobsite, including the most recent and planned equipment inspection dates.

#### 1.6.1.5 Management Reporting

QCS includes a number of reports that Contractor management can use to track the status of the project. The value of these reports is reflective of the quality of the data input, and is maintained in the various sections of QCS. Among these reports are: Progress Payment Request worksheet, QA/QC comments, Submittal Register Status, Three-Phase Inspection checklists.

#### 1.6.2 Finances

##### 1.6.2.1 Pay Activity Data

The QCS database shall include a list of pay activities that the Contractor shall develop in conjunction with the construction schedule. The sum of all pay activities shall be equal to the total contract amount, including modifications. Pay activities shall be grouped by Contract Line Item Number (CLIN), and the sum of the activities shall equal the amount of each CLIN. The total of all CLINs equals the Contract Amount.

##### 1.6.2.2 Payment Requests

All progress payment requests shall be prepared using QCS. The Contractor shall complete the payment request worksheet and include it with the payment request. The work completed under the contract, measured as percent or as specific quantities, shall be updated at least monthly. After the update, the Contractor shall generate a payment request report using QCS. The Contractor shall submit the payment requests with supporting data by E-mail with file attachment(s). If permitted by the Contracting Officer, a data diskette may be used instead of E-mail. A signed paper copy of the approved payment request is also required, which shall govern in the event of discrepancy with the electronic version.

#### 1.6.3 Quality Control (QC)

##### \*1

QCS provides a means to track implementation of the 3-phase QC Control System, prepare daily reports, identify and track deficiencies, document progress of work, and support other contractor QC requirements. The Contractor shall maintain this data on a daily basis. Entered data will automatically output to the QCS generated daily report. The Contractor shall provide the Government a Contractor Quality Control (CQC) Plan within the time required in Section **01451**, CONTRACTOR QUALITY CONTROL. Within seven calendar days of Government acceptance, the Contractor shall submit a data diskette or CD-ROM reflecting the information contained in the

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

accepted CQC Plan: schedule, pay activities, features of work, submittal register, QC requirements, and equipment list.

\*1

## 1.6.3.1 Daily Contractor Quality Control (CQC) Reports.

\*1

QCS includes the means to produce the Daily CQC Report. The Contractor may use other formats to record basic QC data. However, the Daily CQC Report generated by QCS shall be the Contractor's official report. Data from any supplemental reports by the Contractor shall be summarized and consolidated onto the QCS-generated Daily CQC Report. Daily CQC Reports shall be submitted as required by Section 01451, CONTRACTOR QUALITY CONTROL. Reports shall be submitted electronically to the Government using E-mail or diskette within 24 hours after the date covered by the report. Use of either mode of submittal shall be coordinated with the Government representative. The Contractor shall also provide the Government a signed, printed copy of the daily CQC report.

\*1

## 1.6.3.2 Deficiency Tracking.

The Contractor shall use QCS to track deficiencies. Deficiencies identified by the Contractor will be numerically tracked using QC punch list items. The Contractor shall maintain a current log of its QC punch list items in the QCS database. The Government will log the deficiencies it has identified using its QA punch list items. The Government's QA punch list items will be included in its export file to the Contractor. The Contractor shall regularly update the correction status of both QC and QA punch list items.

## 1.6.3.3 Three-Phase Control Meetings

The Contractor shall maintain scheduled and actual dates and times of preparatory and initial control meetings in QCS.

## 1.6.3.4 Accident/Safety Tracking.

The Government will issue safety comments, directions, or guidance whenever safety deficiencies are observed. The Government's safety comments will be included in its export file to the Contractor. The Contractor shall regularly update the correction status of the safety comments. In addition, the Contractor shall utilize QCS to advise the Government of any accidents occurring on the jobsite. This brief supplemental entry is not to be considered as a substitute for completion of mandatory reports, e.g., ENG Form 3394 and OSHA Form 200.

## 1.6.3.5 Features of Work

The Contractor shall include a complete list of the features of work in the QCS database. A feature of work may be associated with multiple pay activities. However, each pay activity (see subparagraph "Pay Activity Data" of paragraph "Finances") will only be linked to a single feature of work.

## 1.6.3.6 QC Requirements

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

The Contractor shall develop and maintain a complete list of QC testing, transferred and installed property, and user training requirements in QCS. The Contractor shall update all data on these QC requirements as work progresses, and shall promptly provide this information to the Government via QCS.

## 1.6.4 Submittal Management

The Government will provide the initial submittal register, ENG Form 4288, SUBMITTAL REGISTER, in electronic format. Thereafter, the Contractor shall maintain a complete list of all submittals, including completion of all data columns. Dates on which submittals are received and returned by the Government will be included in its export file to the Contractor. The Contractor shall use QCS to track and transmit all submittals. ENG Form 4025, submittal transmittal form, and the submittal register update, ENG Form 4288, shall be produced using QCS. RMS will be used to update, store and exchange submittal registers and transmittals, but will not be used for storage of actual submittals.

## 1.6.5 Schedule

\*1

The Contractor shall develop a construction schedule consisting of pay activities, in accordance with Contract Clause "Schedules for Construction Contracts", or Section **01320**, PROJECT SCHEDULE, as applicable. This schedule shall be input and maintained in the QCS database either manually or by using the Standard Data Exchange Format (SDEF) (see Section **01320** PROJECT SCHEDULE). The updated schedule data shall be included with each pay request submitted by the Contractor.

\*1

## 1.6.6 Import/Export of Data

QCS includes the ability to export Contractor data to the Government and to import submittal register and other Government-provided data, and schedule data using SDEF.

## 1.7 IMPLEMENTATION

Contractor use of QCS as described in the preceding paragraphs is mandatory. The Contractor shall ensure that sufficient resources are available to maintain its QCS database, and to provide the Government with regular database updates. QCS shall be an integral part of the Contractor's management of quality control.

## 1.8 DATA SUBMISSION VIA COMPUTER DISKETTE OR CD-ROM

The Government-preferred method for Contractor's submission of updates, payment requests, correspondence and other data is by E-mail with file attachment(s). For locations where this is not feasible, the Contracting Officer may permit use of computer diskettes or CD-ROM for data transfer. Data on the disks or CDs shall be exported using the QCS built-in export function. If used, diskettes and CD-ROMs will be submitted in accordance with the following:

## 1.8.1 File Medium



The Contractor shall submit required data on 3-1/2 inch double-sided high-density diskettes formatted to hold 1.44 MB of data, capable of running under Microsoft Windows 95 or newer. Alternatively, CD-ROMs may be used. They shall conform to industry standards used in the United States. All data shall be provided in English.

#### 1.8.2 Disk or CD-ROM Labels

The Contractor shall affix a permanent exterior label to each diskette and CD-ROM submitted. The label shall indicate in English, the QCS file name, full contract number, contract name, project location, data date, name and telephone number of person responsible for the data.

#### 1.8.3 File Names

The Government will provide the file names to be used by the Contractor with the QCS software.

#### 1.9 MONTHLY COORDINATION MEETING

##### \*1

The Contractor shall update the QCS database each workday. At least monthly, the Contractor shall generate and submit an export file to the Government with schedule update and progress payment request. **Prior to submittal, the Contractor shall meet with the Government representative to review the planned progress payment data submission for errors and omissions.** The Contractor shall make all required corrections prior to Government acceptance of the export file and progress payment request. Payment requests accompanied by incomplete or incorrect data submittals will be returned. The Government will not process progress payments until an acceptable QCS export file is received.

\*1

#### 1.10 NOTIFICATION OF NONCOMPLIANCE

The Contracting Officer will notify the Contractor of any detected noncompliance with the requirements of this specification. The Contractor shall take immediate corrective action after receipt of such notice. Such notice, when delivered to the Contractor at the work site, shall be deemed sufficient for the purpose of notification.

-- End of Section --

SECTION TABLE OF CONTENTS

DIVISION 01 - GENERAL REQUIREMENTS

SECTION 01335

SUBMITTAL PROCEDURES

04/00

PART 1 GENERAL

- 1.1 SUBMITTAL IDENTIFICATION
- 1.2 SUBMITTAL DEFINITIONS
- 1.3 SUBMITTAL CLASSIFICATION
  - 1.3.1 Government Approved (GA)
  - 1.3.2 Information Only (FIO)
  - 1.3.3 Government Approval
- 1.4 APPROVED SUBMITTALS
- 1.5 DISAPPROVED SUBMITTALS
- 1.6 WITHHOLDING OF PAYMENT

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION

- 3.1 GENERAL
- 3.2 SUBMITTAL REGISTER (ENG FORM 4288)
- 3.3 SCHEDULING
- 3.4 ALL SUBMITTALS WHICH EXCEED THE DETAIL SHOWN ON THE CONTRACT DRAWINGS
- 3.5 TRANSMITTAL FORM (ENG FORM 4025)
- 3.6 SUBMITTAL PROCEDURE
  - 3.6.1 Procedures
  - 3.6.2 Deviations
- 3.7 CONTROL OF SUBMITTALS
- 3.8 GOVERNMENT APPROVED SUBMITTALS
- 3.9 INFORMATION ONLY SUBMITTALS
- 3.10 STAMPS

-- End of Section Table of Contents --

SECTION 01335

SUBMITTAL PROCEDURES

04/00

PART 1 GENERAL

1.1 SUBMITTAL IDENTIFICATION

Submittals required are identified by SD numbers as follows:

SD-01 Data

SD-04 Drawings

SD-06 Instructions

SD-07 Schedules

SD-08 Statements

SD-09 Reports

SD-13 Certificates

SD-14 Samples

SD-18 Records

SD-19 Operation and Maintenance Manuals

1.2 SUBMITTAL DEFINITIONS

Definitions of "SUBMITTAL DEFINITIONS" used in Corps of Engineers guide specifications are as follows:

SD-01 Data

Submittals which provide calculations, descriptions, or documentation regarding the work.

SD-04 Drawings

Submittals which graphically show relationship of various components of the work, schematic diagrams of systems, details of fabrication, layouts of particular elements, connections, and other relational aspects of the work.

SD-06 Instructions

Preprinted material describing installation of a product, system or

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

material, including special notices and material safety data sheets, if any, concerning impedances, hazards, and safety precautions.

## SD-07 Schedules

Tabular lists showing location, features, or other pertinent information regarding products, materials, equipment, or components to be used in the work.

## SD-08 Statements

A document, required of the Contractor, or through the Contractor, from a supplier, installer, manufacturer, or other lower tier Contractor, the purpose of which is to confirm the quality or orderly progression of a portion of the work by documenting procedures, acceptability of methods or personnel, qualifications, or other verifications of quality.

## SD-09 Reports

Reports of inspections or tests, including analysis and interpretation of test results.

## SD-13 Certificates

Statement signed by an official authorized to certify on behalf of the manufacturer of a product, system or material, attesting that the product, system or material meets specified requirements. The statement must be dated after the award of the contract, must state the Contractor's name and address, must name the project and location, and must list the specific requirements which are being certified.

## SD-14 Samples

Samples, including both fabricated and unfabricated physical examples of materials, products, and units of work as complete units or as portions of units of work.

## SD-18 Records

Documentation to record compliance with technical or administrative requirements.

## SD-19 Operation and Maintenance Manuals

Data which forms a part of an operation and maintenance manual.

## 1.3 SUBMITTAL CLASSIFICATION

Submittals are classified as follows:

## 1.3.1 Government Approved (GA)

Governmental approval is required for all specification submittal items found in specifications having Structural Steel connections, extensions of

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

design, Fire Protection/Life Safety, and Commissioning of HVAC, and other items as designated by the Contracting Officer. Within the terms of the Contract Clause entitled "Specifications and Drawings for Construction," they are considered to be "shop drawings." The Government will review all submittals designated as deviating from the Solicitation or Accepted Proposal, as described below.

## 1.3.2 Information Only (FIO)

All Contractor submittals not requiring Government approval will be for information only. FIO submittals are identified in the approved submittal register Form 4288. They are not considered to be "shop drawings" within the terms of the Contract Clause referred to above.

## 1.3.3 Government Approval

All submittals classified for Government Approval (GA) are identified in the approved submittal register Form 4288. A code following the "GA" designation indicates the approving authority; codes of "RE" for the Resident Engineer approval, "ED" for Engineering approval, and "AE" for Architect-Engineer approval.

## 1.4 APPROVED SUBMITTALS

The Contracting Officer's approval of submittals shall not be construed as a complete check, but will indicate only that the general method of construction, materials, detailing and other information are satisfactory. Approval will not relieve the Contractor of the responsibility for any error which may exist, as the Contractor under the Contractor Quality Control (CQC) requirements of this contract is responsible for dimensions, the design of adequate connections and details, and the satisfactory construction of all work. After submittals have been approved by the Contracting Officer, no resubmittal for the purpose of substituting materials or equipment will be considered unless accompanied by an explanation of why a substitution is necessary.

## 1.5 DISAPPROVED SUBMITTALS

The Contractor shall make all corrections required by the Contracting Officer and promptly furnish a corrected submittal in the form and number of copies specified for the initial submittal. If the Contractor considers any correction indicated on the submittals to constitute a change to the contract, a notice in accordance with the Contract Clause "Changes" shall be given promptly to the Contracting Officer.

## 1.6 WITHHOLDING OF PAYMENT

Payment for materials incorporated in the work will not be made if required approvals have not been obtained.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION

### 3.1 GENERAL

The Contractor shall submit all items listed on the Submittal Register (ENG 4288 as incorporated in RMS. The Contracting Officer may request submittals in addition to those specified when deemed necessary to adequately describe the work covered in the respective sections. Units of weights and measures used on all submittals shall be the same as those used in the contract drawings. Each submittal shall be complete and in sufficient detail to allow ready determination of compliance with contract requirements. Prior to submittal, all items shall be checked and approved by the Contractor's Quality Control (CQC) System Manager and each item shall be stamped, signed, and dated by the Contractor's Quality Control CQC System Manager indicating action taken. Proposed deviations from the contract requirements shall be clearly identified. Submittals shall include items such as: Contractor's, manufacturer's, or fabricator's drawings; descriptive literature including (but not limited to) catalog cuts, diagrams, operating charts or curves; test reports; test cylinders; samples; O&M manuals (including parts list); certifications; warranties; and other such required submittals. Submittals requiring Government approval shall be scheduled and made prior to the acquisition of the material or equipment covered thereby. Samples remaining upon completion of the work shall be picked up and disposed of in accordance with manufacturer's Material Safety Data Sheets (MSDS) and in compliance with existing laws and regulations.

### 3.2 SUBMITTAL REGISTER (ENG FORM 4288)

At the end of Section 00800, SPECIAL CONTRACT REQUIREMENTS, is one set of ENG Form 4288 listing items of equipment and materials for which submittals are required by the specifications; this list may not be all inclusive and additional submittals may be required. The form will also be found in the RMS software package to be utilized by the Contractor. The Contractor shall update the RMS submittal register by completing the columns for Contractor Schedule Dates and Activity Numbers and return three hard copies to the Contracting Officer for approval within 30 calendar days after Notice to Proceed. The approved submittal register will become the scheduling document and will be used to control submittals throughout the life of the contract. The submittal register and the progress schedules shall be coordinated. NOTE: The Contractor is required to add additional entries to the Submittal Register for all items requiring multiple submittals, including Formwork Shop Drawings per Lift, Concrete Reinforcement per Lift, Concrete Lift Drawings per Lift, Multiple Shop Assembly Drawings, etc. These entries should be made prior to original submission of the submittal register within 30 days of Notice to Proceed.

### 3.3 SCHEDULING

Submittals covering component items forming a system or items that are interrelated shall be scheduled to be coordinated and submitted concurrently. Certifications to be submitted with the pertinent drawings shall be so scheduled. Adequate time (a minimum of 30 calendar days exclusive of mailing time) shall be allowed and shown on the register for review and approval. No delay damages or time extensions will be allowed for time lost in late submittals. An additional 30 calendar days shall be

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

allowed and shown on the register for review and approval of submittals for refrigeration and HVAC control systems.

3.4 ALL SUBMITTALS WHICH EXCEED THE DETAIL SHOWN ON THE CONTRACT DRAWINGS  
\*1

a. Section 00800, SPECIAL CONTRACT REQUIREMENTS, Paragraph 1.8, As-Built Documents, also requires submittal details or drawings which exceed that which is shown on the contract drawings to be transmitted in electronic format. **All such submittals must include, along with the hard copy of the drawings required above, CADD files of the submittal in a commercially available format, such as Microstation, for incorporating into as-built or record drawings.**

\*1

b. These submittals include those that reflect structural details, foundation layouts, equipment, sizes, mechanical room layouts, and other similar data, including all extensions of design, which were not shown or have changed from the original drawings.

3.5 TRANSMITTAL FORM (ENG FORM 4025)

The sample transmittal form (ENG Form 4025) attached at the end of Section 00800 shall be used for submitting both Government approved and information only submittals in accordance with the instructions on the reverse side of the form. These forms will be furnished to the Contractor. This form shall be properly completed by filling out all the heading blank spaces and identifying each item submitted. Special care shall be exercised to ensure proper listing of the specification paragraph and/or sheet number of the contract drawings pertinent to the data submitted for each item.

3.6 SUBMITTAL PROCEDURE

Submittals shall be made as follows:

3.6.1 Procedures

The Contractor shall submit to the Contracting Officer eight (8) copies of all submittals of items requiring shop inspection and six (6) copies of all other submittals as called for under the various headings of these specifications. See paragraph 3.9 concerning For Information Only (FIO) submittals.

3.6.2 Deviations

For submittals which include proposed deviations requested by the Contractor, the column "variation" of ENG Form 4025 shall be checked. The Contractor shall set forth in writing the reason for any deviations and annotate such deviations on the submittal. The Government reserves the right to rescind inadvertent approval of submittals containing unnoted deviations.

3.7 CONTROL OF SUBMITTALS

The Contractor shall carefully control his procurement operations to ensure that each individual submittal is made on or before the Contractor

scheduled submittal date shown on the approved "Submittal Register."

### 3.8 GOVERNMENT APPROVED SUBMITTALS

Upon completion of review of submittals requiring Government approval, the submittals will be identified as having received approval by being so stamped and dated. Four copies of the submittal will be retained by the Contracting Officer and two copies of the submittal will be returned to the Contractor.

### 3.9 INFORMATION ONLY SUBMITTALS

Normally submittals for information only will not be returned. Approval of the Contracting Officer is not required on information only submittals. The Government reserves the right to require the Contractor to resubmit any item found not to comply with the contract. This does not relieve the Contractor from the obligation to furnish material conforming to the plans and specifications; will not prevent the Contracting Officer from requiring removal and replacement of nonconforming material incorporated in the work; and does not relieve the Contractor of the requirement to furnish samples for testing by the Government laboratory or for check testing by the Government in those instances where the technical specifications so prescribe.

### 3.10 STAMPS

Stamps used by the Contractor on the submittal data to certify that the submittal meets contract requirements shall be similar to the following:



CONTRACTOR (Firm Name)	
_____	Approved
_____	Approved with corrections as noted on submittal data and/or sheet(s) attached.
SIGNATURE: _____	
TITLE: _____	
DATE: _____	

-- End of Section --

SECTION TABLE OF CONTENTS

DIVISION 01 - GENERAL REQUIREMENTS

SECTION 01451

CONTRACTOR QUALITY CONTROL

04/00

PART 1 GENERAL

- 1.1 REFERENCES
- 1.2 PAYMENT

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION

- 3.1 GENERAL REQUIREMENTS
- 3.2 QUALITY CONTROL PLAN
  - 3.2.1 Content of the CQC Plan
  - 3.2.2 Acceptance of Plan
  - 3.2.3 Notification of Changes
- 3.3 COORDINATION MEETING
  - 3.3.1 Subcontractor CQC Orientation
- 3.4 QUALITY CONTROL ORGANIZATION
  - 3.4.1 Personnel Requirements
  - 3.4.2 CQC System Manager
  - 3.4.3 CQC Personnel
  - 3.4.4 Additional Requirement
  - 3.4.5 Organizational Changes
- 3.5 SUBMITTALS AND DELIVERABLES
- 3.6 CONTROL
  - 3.6.1 Preparatory Phase
  - 3.6.2 Initial Phase
  - 3.6.3 Follow-up Phase
  - 3.6.4 Additional Preparatory and Initial Phases
- 3.7 TESTS
  - 3.7.1 Testing Procedure
  - 3.7.2 Testing Laboratories
    - 3.7.2.1 Capability Check
    - 3.7.2.2 Capability Recheck
  - 3.7.3 Onsite Laboratory
  - 3.7.4 Furnishing or Transportation of Samples for Testing
- 3.8 COMPLETION INSPECTION
  - 3.8.1 Punch-Out Inspection
  - 3.8.2 Pre-Final Inspection
  - 3.8.3 Final Acceptance Inspection
- 3.9 DOCUMENTATION

AMENDMENT #0001

\*\*\*SAFETY PAYS\*\*\*

McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

3.10 SAMPLE FORMS GENERATED BY RMS SOFTWARE

3.11 NOTIFICATION OF NONCOMPLIANCE

-- End of Section Table of Contents --

## SECTION 01451

## CONTRACTOR QUALITY CONTROL

04/00

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

## AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 3740 (1996) Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction

ASTM E 329 (1995b) Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction

## 1.2 PAYMENT

Separate payment will not be made for providing and maintaining an effective Quality Control program, and all costs associated therewith shall be included in the applicable unit prices or lump-sum prices contained in the Bidding Schedule.

## PART 2 PRODUCTS (Not Applicable)

## PART 3 EXECUTION

## 3.1 GENERAL REQUIREMENTS

The Contractor is responsible for quality control and shall establish and maintain an effective quality control system in compliance with the Contract Clause titled "Inspection of Construction." The quality control system shall consist of plans, procedures, and organization necessary to produce an end product which complies with the contract requirements. The system shall cover all construction operations, both onsite and offsite, and shall be keyed to the proposed construction sequence. The project superintendent will be held responsible for the quality of work on the job and is subject to removal by the Contracting Officer for non-compliance with quality requirements specified in the contract. The project superintendent in this context shall mean the individual with the responsibility for the overall management of the project including quality and production. The project superintendent shall maintain a physical presence at the site at all times, except as otherwise acceptable to the

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

Contracting Officer, and shall be responsible for all construction and construction related activities at the site.

### 3.2 QUALITY CONTROL PLAN

The Contractor shall furnish for review by the Government, not later than 30 days after receipt of notice to proceed, the Contractor Quality Control (CQC) Plan proposed to implement the requirements of the Contract Clause titled "Inspection of Construction." The plan shall identify personnel, procedures, control, instructions, tests, records, and forms to be used. The Government will consider an interim plan for the first 30 days of operation. Construction will be permitted to begin only after acceptance of the CQC Plan or acceptance of an interim plan applicable to the particular feature of work to be started. Work outside of the features of work included in an accepted interim plan will not be permitted to begin until acceptance of a CQC Plan or another interim plan containing the additional features of work to be started.

#### 3.2.1 Content of the CQC Plan

The CQC Plan shall include, as a minimum, the following to cover all construction operations, both onsite and offsite, including work by subcontractors, fabricators, suppliers, and purchasing agents:

- a. A description of the quality control organization, including a chart showing lines of authority and acknowledgment that the CQC staff shall implement the three phase control system for all aspects of the work specified. The staff shall include a CQC System Manager who shall report to the project superintendent.
- b. The name, qualifications (in resume format), duties, responsibilities, and authorities of each person assigned a CQC function.
- c. A copy of the letter to the CQC System Manager signed by an authorized official of the firm which describes the responsibilities and delegates sufficient authorities to adequately perform the functions of the CQC System Manager, including authority to stop work which is not in compliance with the contract. The CQC System Manager shall issue letters of direction to all other various quality control representatives outlining duties, authorities, and responsibilities. Copies of these letters shall also be furnished to the Government.
- d. Procedures for scheduling, reviewing, certifying, and managing submittals, including those of subcontractors, offsite fabricators, suppliers, and purchasing agents. These procedures shall be in accordance with Section 01335 SUBMITTAL PROCEDURES.
- e. Control, verification, and acceptance testing procedures for each specific test to include the test name, specification paragraph requiring test, feature of work to be tested, test frequency, and person responsible for each test. (Laboratory facilities will be

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

approved by the Contracting Officer.)

- f. Procedures for tracking preparatory, initial, and follow-up control phases and control, verification, and acceptance tests including documentation.
- g. Procedures for tracking construction deficiencies from identification through acceptable corrective action. These procedures shall establish verification that identified deficiencies have been corrected.
- h. Reporting procedures, including proposed reporting formats.
- i. A list of the definable features of work. A definable feature of work is a task which is separate and distinct from other tasks, has separate control requirements, and may be identified by different trades or disciplines, or it may be work by the same trade in a different environment. Although each section of the specifications may generally be considered as a definable feature of work, there are frequently more than one definable features under a particular section. This list will be agreed upon during the coordination meeting.

### 3.2.2 Acceptance of Plan

Acceptance of the Contractor's plan is required prior to the start of construction. Acceptance is conditional and will be predicated on satisfactory performance during the construction. The Government reserves the right to require the Contractor to make changes in his CQC Plan and operations including removal of personnel, as necessary, to obtain the quality specified.

### 3.2.3 Notification of Changes

After acceptance of the CQC Plan, the Contractor shall notify the Contracting Officer in writing of any proposed change. Proposed changes are subject to acceptance by the Contracting Officer.

### 3.3 COORDINATION MEETING

After the Preconstruction Conference, before start of construction, and prior to acceptance by the Government of the CQC Plan, the Contractor shall meet with the Contracting Officer or Authorized Representative and discuss the Contractor's quality control system. The CQC Plan shall be submitted for review a minimum of 30 calendar days prior to the Coordination Meeting.

During the meeting, a mutual understanding of the system details shall be developed, including the forms for recording the CQC operations, control activities, testing, administration of the system for both onsite and offsite work, and the interrelationship of Contractor's Management and control with the Government's Quality Assurance. Minutes of the meeting shall be prepared by the Government and signed by both the Contractor and the Contracting Officer. The minutes shall become a part of the contract file. There may be occasions when subsequent conferences will be called by either party to reconfirm mutual understandings and/or address deficiencies

in the CQC system or procedures which may require corrective action by the Contractor.

### 3.3.1 Subcontractor CQC Orientation

Before a Subcontractor begins work on the jobsite, the CQC Manager will train the Subcontractor by showing the video tape entitled "CQC - A Bridge (or Pathway) to Success" and answering any questions pertaining to quality control operations. This requirement is waived only if a Subcontractor attended the initial coordination meeting described above. A copy of this video can be borrowed from the Contracting Officer. A record of the orientation shall be documented in the QC Report.

### 3.4 QUALITY CONTROL ORGANIZATION

#### 3.4.1 Personnel Requirements

The requirements for the CQC organization are a CQC System Manager and sufficient number of additional qualified personnel to ensure contract compliance. The Contractor shall provide a CQC organization which shall be at the site at all times during progress of the work and with complete authority to take any action necessary to ensure compliance with the contract. All CQC staff members shall be subject to acceptance by the Contracting Officer.

#### 3.4.2 CQC System Manager

\*1

The Contractor shall identify as CQC System Manager an individual within the onsite work organization who shall be responsible for overall management of CQC and have the authority to act in all CQC matters for the Contractor. The CQC System Manager shall be a graduate engineer or a graduate of construction management with a minimum of 10 years quality management experience on similar construction, or an individual with a minimum of 20 years quality management experience on similar construction. This CQC System Manager shall be on the site at all times during construction and shall be employed by the prime Contractor. The CQC System Manager shall be assigned no other duties. An alternate for the CQC System Manager shall be identified in the plan to serve in the event of the System Manager's absence. The requirements for the alternate shall be similar as for the designated CQC System Manager. The CQCSM shall be employed on regular day shift. An alternate CQCSM shall be employed and on-site during second and third shifts, weekends and holidays (while work is in progress). Alternates shall be responsible to the CQCSM.

\*1

#### 3.4.3 CQC Personnel

In addition to CQC personnel specified elsewhere in the contract, the Contractor shall provide as part of the CQC organization specialized personnel to assist the CQC System Manager for the following areas: electrical, mechanical, civil, structural, concrete/RCC, steel reinforcing, blasting, and submittals/lift drawings. There shall be one individual for each area of specialization; one individual shall not serve as a specialist in more than one area of specialization. These individuals shall be directly employed by the prime Contractor and may not be employed by a

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

supplier or sub-contractor on this project; be responsible to the CQC System Manager; be physically present at the construction site during work on their areas of responsibility; have the necessary education and/or experience in accordance with the experience matrix listed herein. These individuals shall have no other duties other than quality control. These individuals shall participate in the review of submittals falling within their respective disciplines.

## Experience Matrix

	Area	Qualifications
a.	Civil	Graduate Civil Engineer with 5 years experience in the type of work being performed on this project
b.	Mechanical	Graduate Mechanical Engineer with 5 yrs experience
c.	Electrical	Graduate Electrical Engineer with 5 yrs related experience
d.	Structural	Graduate Structural Engineer with 5 yrs experience
e.	Concrete/RCC	Concrete/RCC Technician with 10 yrs experience
f.	Steel Reinforcing	Steel Reinforcing Technician with 5 yrs experience
g.	Blasting	Blasting Specialist with 5 yrs experience
h.	Submittals/Lift Drawings	Submittals/Lift Drawings Technician with 1 year experience

## 3.4.4 Additional Requirement

In addition to the above experience and education requirements all CQC



## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

System personnel (Including the Systems Manager, the Alternate CQC Systems Manager, Shift leaders and specialists) as well as Superintendents, shall have completed and passed the course entitled "Construction Quality Management For Contractors". This course is periodically offered by the Associated Builders and Constructors, Inc., or Associated General Contractor, Inc.

### 3.4.5 Organizational Changes

The Contractor shall maintain the CQC staff at full strength at all times. When it is necessary to make changes to the CQC staff, the Contractor shall revise the CQC Plan to reflect the changes and submit the changes to the Contracting Officer for acceptance. These changes shall be accepted by the Government prior to implementation.

### 3.5 SUBMITTALS AND DELIVERABLES

Submittals, if needed, shall be made as specified in Section 01335 SUBMITTAL PROCEDURES. The CQC organization shall be responsible for certifying that all submittals and deliverables are in compliance with the contract requirements.

### 3.6 CONTROL

Contractor Quality Control is the means by which the Contractor ensures that the construction, to include that of subcontractors and suppliers, complies with the requirements of the contract. At least three phases of control shall be conducted by the CQC System Manager for each definable feature of work as follows:

#### 3.6.1 Preparatory Phase

This phase shall be performed prior to beginning work on each definable feature of work, after all required plans/documents/materials are approved/accepted, and after copies are at the work site. This phase shall include:

- a. A review of each paragraph of applicable specifications, reference codes, and standards. A copy of those sections of referenced codes and standards applicable to that portion of the work to be accomplished in the field shall be made available by the Contractor at the preparatory inspection. These copies shall be maintained in the field and available for use by Government personnel until final acceptance of the work.
- b. A review of the contract drawings.
- c. A check to assure that all materials and/or equipment have been tested, submitted, and approved.
- d. Review of provisions that have been made to provide required control inspection and testing.
- e. Examination of the work area to assure that all required

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

preliminary work has been completed and is in compliance with the contract.

- f. A physical examination of required materials, equipment, and sample work to assure that they are on hand, conform to approved shop drawings or submitted data, and are properly stored.
- g. A review of the appropriate activity hazard analysis to assure safety requirements are met.
- h. Discussion of procedures for controlling quality of the work including repetitive deficiencies. Document construction tolerances and workmanship standards for that feature of work.
- i. A check to ensure that the portion of the plan for the work to be performed has been accepted by the Contracting Officer.
- j. Resolve all differences.
- k. Discussion of the initial control phase.
- l. The Government shall be notified at least 24 hours in advance of beginning the preparatory control phase. This phase shall include a meeting conducted by the CQC System Manager and attended by the superintendent, other CQC personnel (as applicable), and the foreman responsible for the definable feature. The results of the preparatory phase actions shall be documented by separate minutes prepared by the CQC System Manager and attached to the daily CQC report. The Contractor shall instruct applicable workers as to the acceptable level of workmanship required in order to meet contract specifications.

### 3.6.2 Initial Phase

This phase shall be accomplished at the beginning of a definable feature of work. All persons to be involved with this feature of work shall attend. This includes supervisors, inspectors, foremen, tradesmen, QC technicians, and laborers. The following shall be accomplished:

- a. A check of work to ensure that it is in full compliance with contract requirements. Review minutes of the preparatory meeting.
- b. Verify adequacy of controls to ensure full contract compliance. Verify required control inspection and testing.
- c. Establish level of workmanship and verify that it meets minimum acceptable workmanship standards. Compare with required sample panels as appropriate.
- d. Resolve all differences.
- e. Check safety to include compliance with and upgrading of the safety plan and activity hazard analysis. Review the activity analysis with each worker.

- f. The Government shall be notified at least 24 hours in advance of beginning the initial phase. Separate minutes of this phase shall be prepared by the CQC System Manager and attached to the daily CQC report. Exact location of initial phase shall be indicated for future reference and comparison with follow-up phases.
- g. The initial phase should be repeated for each new crew to work onsite, or any time acceptable specified quality standards are not being met.

### 3.6.3 Follow-up Phase

Daily checks shall be performed to assure control activities, including control testing, are providing continued compliance with contract requirements, until completion of the particular feature of work. The checks shall be made a matter of record in the CQC documentation. Final follow-up checks shall be conducted and all deficiencies corrected prior to the start of additional features of work which may be affected by the deficient work. The Contractor shall not build upon nor conceal non-conforming work.

### 3.6.4 Additional Preparatory and Initial Phases

Additional preparatory and initial phases shall be conducted on the same definable features of work if: the quality of on-going work is unacceptable; if there are changes in the applicable CQC staff, onsite production supervision or work crew; if work on a definable feature is resumed after a substantial period of inactivity; or if other problems develop.

## 3.7 TESTS

### 3.7.1 Testing Procedure

The Contractor shall perform specified or required tests to verify that control measures are adequate to provide a product which conforms to contract requirements. Upon request, the Contractor shall furnish to the Government duplicate samples of test specimens for possible testing by the Government. Testing includes operation and/or acceptance tests when specified. The Contractor shall procure the services of a Corps of Engineers approved testing laboratory or establish an approved testing laboratory at the project site. The Contractor shall perform the following activities and record and provide the following data:

- a. Verify that testing procedures comply with contract requirements.
- b. Verify that facilities and testing equipment are available and comply with testing standards.
- c. Check test instrument calibration data against certified standards.
- d. Verify that recording forms and test identification control number system, including all of the test documentation requirements, have

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

been prepared.

- e. Results of all tests taken, both passing and failing tests, shall be recorded on the CQC report for the date taken. Specification paragraph reference, location where tests were taken, and the sequential control number identifying the test shall be given. If approved by the Contracting Officer, actual test reports may be submitted later with a reference to the test number and date taken. An information copy of tests performed by an offsite or commercial test facility shall be provided directly to the Contracting Officer. Failure to submit timely test reports as stated may result in nonpayment for related work performed and disapproval of the test facility for this contract.

### 3.7.2 Testing Laboratories

#### 3.7.2.1 Capability Check

The Government reserves the right to check laboratory equipment in the proposed laboratory for compliance with the standards set forth in the contract specifications and to check the laboratory technician's testing procedures and techniques. Laboratories utilized for testing soils, concrete, asphalt, and steel shall meet criteria detailed in ASTM D 3740 and ASTM E 329.

#### 3.7.2.2 Capability Recheck

If the selected laboratory fails the capability check, the Contractor will be assessed a charge of \$1375.00 to reimburse the Government for each succeeding recheck of the laboratory or the checking of a subsequently selected laboratory. Such costs will be deducted from the contract amount due the Contractor.

#### 3.7.3 Onsite Laboratory

The Government reserves the right to utilize the Contractor's control testing laboratory and equipment to make assurance tests, and to check the Contractor's testing procedures, techniques, and test results at no additional cost to the Government.

#### 3.7.4 Furnishing or Transportation of Samples for Testing

Costs incidental to the transportation of samples or materials shall be borne by the Contractor. Samples of materials for test verification and acceptance testing by the Government shall be delivered to the Corps of Engineers Division Laboratory, f.o.b., at the following address:

For delivery by mail:

Commander and Director  
U.S. Army Engineer Waterways Experiment Station  
ATTN: CEWES-GS  
3909 Halls Ferry Road  
Vicksburg, MS 39180-6199

Coordination for each specific test, exact delivery location, and dates will be made through the Resident Office.

### 3.8 COMPLETION INSPECTION

#### 3.8.1 Punch-Out Inspection

Near the end of the work, or any increment of the work established by a time stated in the Special Clause, "Commencement, Prosecution, and Completion of Work", or by the specifications, the CQC Manager shall conduct an inspection of the work. A punch list of items which do not conform to the approved drawings and specifications shall be prepared and included in the CQC documentation, as required by paragraph DOCUMENTATION. The list of deficiencies shall include the estimated date by which the deficiencies will be corrected. The CQC System Manager or staff shall make a second inspection to ascertain that all deficiencies have been corrected.

Once this is accomplished, the Contractor shall notify the Government that the facility is ready for the Government Pre-Final inspection.

#### 3.8.2 Pre-Final Inspection

The Government will perform the pre-final inspection to verify that the facility is complete and ready to be occupied. A Government Pre-Final Punch List may be developed as a result of this inspection. The Contractor's CQC System Manager shall ensure that all items on this list have been corrected before notifying the Government, so that a Final inspection with the customer can be scheduled. Any items noted on the Pre-Final inspection shall be corrected in a timely manner. These inspections and any deficiency corrections required by this paragraph shall be accomplished within the time slated for completion of the entire work or any particular increment of the work if the project is divided into increments by separate completion dates.

#### 3.8.3 Final Acceptance Inspection

The Contractor's Quality Control Inspection personnel, plus the superintendent or other primary management person, and the Contracting Officer's Representative shall be in attendance at the final acceptance inspection. Additional Government personnel including, but not limited to, those from Base/Post Civil Facility Engineer user groups, and major commands may also be in attendance. The final acceptance inspection will be formally scheduled by the Contracting Officer based upon results of the Pre-Final inspection. Notice shall be given to the Contracting Officer at least 14 days prior to the final acceptance inspection and shall include the Contractor's assurance that all specific items previously identified to the Contractor as being unacceptable, along with all remaining work performed under the contract, will be complete and acceptable by the date scheduled for the final acceptance inspection. Failure of the Contractor to have all contract work acceptably complete for this inspection will be cause for the Contracting Officer to bill the Contractor for the Government's additional inspection cost in accordance with the contract clause titled "Inspection of Construction".

## 3.9 DOCUMENTATION

The Contractor shall maintain current records providing factual evidence that required quality control activities and/or tests have been performed. These records shall include the work of subcontractors and suppliers and shall be on an acceptable form that includes, as a minimum, the following information:

- a. Contractor/subcontractor and their area of responsibility.
- b. Operating plant/equipment with hours worked, idle, or down for repair.
- c. Work performed each day, giving location, description, and by whom. When Network Analysis (NAS) is used, identify each phase of work performed each day by NAS activity number.
- d. Test and/or control activities performed with results and references to specifications/drawings requirements. The control phase shall be identified (Preparatory, Initial, Follow-up). List of deficiencies noted, along with corrective action.
- e. Quantity of materials received at the site with statement as to acceptability, storage, and reference to specifications/drawings requirements.
- f. Submittals and deliverables reviewed, with contract reference, by whom, and action taken.
- g. Offsite surveillance activities, including actions taken.
- h. Job safety evaluations stating what was checked, results, and instructions or corrective actions.
- i. Instructions given/received and conflicts in plans and/or specifications.
- j. Contractor's verification statement.
- k. These records shall indicate a description of trades working on the project; the number of personnel working; weather conditions encountered; and any delays encountered. These records shall cover both conforming and deficient features and shall include a statement that equipment and materials incorporated in the work and workmanship comply with the contract. The original and one copy of these records in report form shall be furnished to the Government no later than noon the next business day after the date covered by the report. A report shall be submitted for each calendar day. Days of no work shall be indicated as such on the report. All calendar days shall be accounted for throughout the life of the contract. Reports shall be signed and dated by the CQC System Manager. The report from the CQC System Manager shall include copies of test reports and copies of reports prepared by all subordinate quality control personnel.

1. Deficiency Tracking System. The Contractor shall maintain a cumulative list of deficiencies identified for the duration of the project. Deficiencies to be listed include those failures, Government oral observations and Notifications of Noncompliance. The list shall be maintained at the project site. Copies of updated listings shall be submitted to the Government at least every 30 days.

### 3.10 SAMPLE FORMS GENERATED BY RMS SOFTWARE

Sample forms for Daily Construction Quality Control Report and Deficiency List are enclosed at the end of Section 00800 as well as other forms the Contractor may utilize during this project.

### 3.11 NOTIFICATION OF NONCOMPLIANCE

The Contracting Officer will notify the Contractor of any detected noncompliance with the foregoing requirements. The Contractor shall take immediate corrective action after receipt of such notice. Such notice, when delivered to the Contractor at the work site, shall be deemed sufficient for the purpose of notification. If the Contractor fails or refuses to comply promptly, the Contracting Officer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No part of the time lost due to such stop orders shall be made the subject of claim for extension of time or for excess costs or damages by the Contractor.

-- End of Section --

SECTION TABLE OF CONTENTS

DIVISION 01 - GENERAL REQUIREMENTS

SECTION 01500

TEMPORARY CONSTRUCTION FACILITIES

02/97

PART 1 GENERAL

- 1.1 REFERENCES
- 1.2 SUBMITTALS
- 1.3 PAYMENT

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION

- 3.1 GENERAL REQUIREMENTS
  - 3.1.1 Site Plan
  - 3.1.2 Identification of Employees
- 3.2 AVAILABILITY AND USE OF UTILITY SERVICES
  - 3.2.1 Utility Service
  - 3.2.2 Sanitation
  - 3.2.3 Telephone
- 3.3 BULLETIN BOARD, PROJECT SIGN, AND PROJECT SAFETY SIGN
  - 3.3.1 Bulletin Board
  - 3.3.2 Project and Safety Signs
- 3.4 PROTECTION AND MAINTENANCE OF TRAFFIC
  - 3.4.1 Haul Roads
  - 3.4.2 Barricades
- 3.5 CONTRACTOR'S TEMPORARY FACILITIES
  - 3.5.1 Administrative Field Offices
  - 3.5.2 Storage Area
  - 3.5.3 Appearance of Trailers
  - 3.5.4 Maintenance of Storage Area
  - 3.5.5 Security Provisions
- 3.6 NOT USED
- 3.7 PLANT COMMUNICATION
- 3.8 NOT USED
- 3.9 CLEANUP
- 3.10 RESTORATION OF STORAGE AREA

-- End of Section Table of Contents --



## SECTION 01500

## TEMPORARY CONSTRUCTION FACILITIES

02/97

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

U.S. ARMY CORPS OF ENGINEERS (COE)

COE EM 385-1-1

(Sep 1996) Safety and Health Requirements  
Manual

## 1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. Submittals for materials, fabrication and installation shall be as required in the sections of the specifications covering the particular materials. The following additional submittals for the cofferdam shall be submitted in accordance with Section 01335 Submittals.

SD-04 Drawings

Site Plan; GA,RE

## 1.3 PAYMENT

No separate payment or direct payment will be made for the cost of the work covered under this section, and such work will be considered as a subsidiary obligation of the Contract.

## PART 2 PRODUCTS (NOT APPLICABLE)

## PART 3 EXECUTION

## 3.1 GENERAL REQUIREMENTS

## 3.1.1 Site Plan

The Contractor shall prepare a site plan, for the entire area shown to be within the construction limits, indicating the proposed location and dimensions of any area to be fenced and used by the Contractor, the location of trailers to be used, avenues of ingress/egress to the fenced area and details of the fence installation. Any areas which may have to be graveled to prevent the tracking of mud shall also be identified. The

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

Contractor shall also prepare site plans for any supplemental staging areas, including any office facilities to be provided for the Government. The site plans shall conform to all requirements set forth in COE EM 385-1-1.

## 3.1.2 Identification of Employees

The Contractor shall follow the guidelines prescribed in Section 00800 paragraph 1.18.

## 3.2 AVAILABILITY AND USE OF UTILITY SERVICES

## 3.2.1 Utility Service

The Contractor is responsible for his/her own electrical power service requirements. Currently adequate power exists to the current Cofferdam Contractors Staging Area. Power characteristics are 13.8 kV, three phase. Power at the site can be obtained from Louisville Gas and Electric Company (LG&E), 820 West Broadway, P.O. Box 32020, Louisville, Kentucky 40232. The POC is Jim Holderman, (502) 627-3384.

The Contractor is responsible for his/her own water requirements. The Contractor will be allowed to connect on to the Corps of Engineers waterline. However, the Contractor will need to install a meter and will be responsible for payment for the amount of water used. The Contractor will be responsible for reading the meter monthly, and shall pay the Corps of Engineers for the water used on a quarterly basis. Separately metered water service is available at the current Cofferdam Contractors Staging Area west of the Resident Engineers office.

## 3.2.2 Sanitation

The Contractor shall provide and maintain within the construction area minimum field-type sanitary facilities approved by the Contracting Officer. Government toilet facilities will not be available to Contractor's personnel.

## 3.2.3 Telephone

The Contractor shall make arrangements and pay all costs for telephone facilities desired.

## 3.3 BULLETIN BOARD, PROJECT SIGN, AND PROJECT SAFETY SIGN

## 3.3.1 Bulletin Board

Immediately upon beginning of work, the Contractor shall provide a weatherproof glass-covered bulletin board not less than 36 by 48 inches in size for displaying the Equal Employment Opportunity poster, a copy of the wage decision contained in the contract, Wage Rate Information poster, and other information approved by the Contracting Officer. The bulletin board shall be located at the project site in a conspicuous place easily accessible to all employees, as approved by the Contracting Officer. Legible copies of the aforementioned data shall be displayed until work is completed. Upon completion of work the bulletin board shall be removed by

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

and remain the property of the Contractor.

### 3.3.2 Project and Safety Signs

The requirements for the project sign, its content, and location shall be as described in Section 0800, Special Contract Requirements paragraph 1.26. The sign shall be erected within 15 days after receipt of the notice to proceed. The requirements for the safety sign and location shall be as directed by the Contracting Officer. The sign shall state the following:

CALENDAR DAYS WORKED WITHOUT A LOST TIME ACCIDENT

The data required by the safety sign shall be corrected daily, with light colored metallic or non-metallic numerals. Upon completion of the project, the signs shall be removed from the site.

### 3.4 PROTECTION AND MAINTENANCE OF TRAFFIC

During construction the Contractor shall provide access and temporary relocated roads as necessary to maintain traffic. The Contractor shall maintain and protect traffic on all affected roads during the construction period except as otherwise specifically directed by the Contracting Officer. Measures for the protection and diversion of traffic, including the provision of watchmen and flagmen, erection of barricades, placing of lights around and in front of equipment and the work, and the erection and maintenance of adequate warning, danger, and direction signs, shall be as required by EM385-1-1 as well as the State and local authorities having jurisdiction. The traveling public shall be protected from damage to person and property. The Contractor's traffic on roads selected for hauling material to and from the site shall not interfere with railroad traffic at the 26th Street crossing and interfere as little as possible with public traffic. The Contractor shall investigate the adequacy of existing roads and the allowable load limit on these roads. The Contractor shall be responsible for the repair of any damage to roads caused by construction operations.

All access roads and haul roads, whether built under this contract or not, shall be made available to Government forces, LG&E personnel, and other Government contractors working in the vicinity. The project roads at the McAlpine site shall remain open at all times. In particular, availability of access to Shippingport Island and the LG&E Hydropower Plant shall be maintained at all times. Vehicle speed shall be as posted or slower if directed. The Government shall suspend or restrict usage of project roads at any time the requirements specified are not met or if it is in the best interests of the Government.

#### 3.4.1 Haul Roads

The Contractor shall, at its own expense, construct access and haul roads necessary for proper prosecution of the work under this contract. Haul roads shall be constructed with suitable grades and widths; sharp curves, blind corners, and dangerous cross traffic shall be avoided. The Contractor shall provide necessary lighting, signs, barricades, and distinctive markings for the safe movement of traffic. The method of dust control shall be adequate to ensure safe operation at all times. Location, grade, width, and alignment of construction and hauling roads shall be

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

subject to approval by the Contracting Officer. Lighting shall be adequate to assure full and clear visibility for full width of haul road and work areas during any night work operations. Upon completion of the work, haul roads designated by the Contracting Officer shall be removed.

#### 3.4.2 Barricades

The Contractor shall erect and maintain temporary barricades to limit public access to hazardous areas. Such barricades shall be required whenever safe public access to paved areas such as roads, parking areas or sidewalks is prevented by construction activities or as otherwise necessary to ensure the safety of both pedestrian and vehicular traffic. Barricades shall be securely placed, clearly visible with adequate illumination to provide sufficient visual warning of the hazard during both day and night.

#### 3.5 CONTRACTOR'S TEMPORARY FACILITIES

##### 3.5.1 Administrative Field Offices

The Contractor shall provide and maintain administrative field office facilities within the construction area at the designated site. Government office and warehouse facilities will not be available to the Contractor's personnel.

##### 3.5.2 Storage Area

The Contractor shall construct a temporary 6 foot high chain link fence around trailers and materials. Fence posts may be driven, in lieu of concrete bases, where soil conditions permit. Mobile equipment, such as tractors, wheeled lifting equipment, cranes, trucks, and like equipment, shall be parked within the fenced area at the end of each work day.

##### 3.5.3 Appearance of Trailers

Trailers utilized by the Contractor for administrative or material storage purposes shall present a clean and neat exterior appearance and shall be in a state of good repair. Trailers which, in the opinion of the Contracting Officer, require exterior painting or maintenance will not be allowed on the Government property.

##### 3.5.4 Maintenance of Storage Area

Fencing shall be kept in a state of good repair and proper alignment. Should the Contractor elect to traverse, with construction equipment or other vehicles, grassed or unpaved areas which are not established roadways, such areas shall be covered with a layer of gravel as necessary to prevent rutting and the tracking of mud onto paved or established roadways; gravel gradation shall be at the Contractor's discretion. Grass located within the boundaries of the construction site shall be mowed for the duration of the project. Grass and vegetation along fences, buildings, under trailers, and in areas not accessible to mowers shall be edged or trimmed neatly.

##### 3.5.5 Security Provisions

Adequate outside security lighting shall be provided at the Contractor's temporary facilities. The Contractor shall be responsible for the security of its own equipment; in addition, the Contractor shall provide a security guard with guard shack and other provisions such as gates and radio communication at the 26th Street entrance to the site. The security provisions must be provided 24 hours per day, 7 days per week. The guard shack shall have adequate AC/Heat for use during extreme weather conditions. In addition, a second security guard shall be provided, at a location to be determined, 24 hours per day, 7 days per week. All security provisions shall be portable in order to accomodate construction activities throughout the progress of the job as aproved by the Contracting Officer.

### 3.6 NOT USED

### 3.7 PLANT COMMUNICATION

Whenever the Contractor has the individual elements of its plant so located that operation by normal voice between these elements is not satisfactory, the Contractor shall install a satisfactory means of communication, such as telephone or other suitable devices. The devices shall be made available for use by Government personnel.

### 3.8 NOT USED

### 3.9 CLEANUP

#### \*1

Construction debris, waste materials, packaging material and the like shall be removed from the work site daily. **Paved roads to be used by the general public, LG&E, and the Government shall be cleaned and maintained to the standard of street sweeper on a daily basis as a minimum.** Additional maintenance and cleaning may be required more frequently due to construction activities as determined by the Contracting Officer. Materials resulting from demolition activities which are salvageable shall be stored within the fenced area described above or at a supplemental storage area designated by the Contracting Officer. Stored material not in trailers, whether new or salvaged, shall be neatly stacked when stored.

\*1

### 3.10 RESTORATION OF STORAGE AREA

Upon completion of the project and after removal of trailers, materials, and equipment from within the fenced area, the fence shall be removed and will become the property of the Contractor. Areas used by the Contractor for the storage of equipment or material, or other use, shall be restored to the original or better condition. Gravel used to traverse grassed areas shall be removed and the area restored to its original condition, including top soil and seeding as necessary.

-- End of Section --

SECTION TABLE OF CONTENTS

DIVISION 02 - SITE WORK

SECTION 02130

CONTROL OF WATER

PART 1 GENERAL

- 1.1 GENERAL REQUIREMENTS
  - 1.1.1 Cofferdam
  - 1.1.2 Water Control in Coffercells
  - 1.1.3 Water Control in Upstream Binwall
  - 1.1.4 Water Control in 360 Nose Pier
  - 1.1.5 Monitoring and Testing Water Control Systems
- 1.2 REFERENCES
- 1.3 REQUIRED WATER CONTROL FACILITIES
- 1.4 DEFINITIONS
  - 1.4.1 Foundation Bedrock
  - 1.4.2 Replacement Systems
  - 1.4.3 Supplemental Systems
  - 1.4.4 Pressure Reduction
  - 1.4.5 Water Control
  - 1.4.6 Unwatering
  - 1.4.7 Cofferdam
  - 1.4.8 Emergency Flooding
- 1.5 PAYMENT
  - 1.5.1 Operation and Maintenance
- 1.6 SUBMITTALS
- 1.7 CONTRACTOR RESPONSIBILITY
- 1.8 QUALIFICATIONS AND DUTIES OF CONTRACTOR
  - 1.8.1 General
  - 1.8.2 Dewatering Superintendent
    - 1.8.2.1 Materials and Equipment
    - 1.8.2.2 Installation
    - 1.8.2.3 Operation and Maintenance
    - 1.8.2.4 Quality Assurance
- 1.9 INSTALLED SYSTEM
  - 1.9.1 Subsurface Data
  - 1.9.2 Subsurface Conditions.
  - 1.9.3 Chemical Characteristics of River Water
  - 1.9.4 Pumping Test

PART 2 PRODUCTS

- 2.1 General
- 2.2 WELL TOPS AND PROTECTION OF WELLS
- 2.3 SUBMERSIBLE PUMPS AND WIRING.
  - 2.3.1 Submersible Pump Capacities
- 2.4 DISCHARGE SYSTEM.
- 2.5 MATERIALS OTHER THAN PUMPS AND DISCHARGE SYSTEM.
  - 2.5.1 Riser Pipes.

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

- 2.5.2 Screen.
- 2.5.3 Filter Sand.
- 2.6 SPARE PARTS.

## PART 3 EXECUTION

- 3.1 GENERAL.
- 3.2 CONTROL REQUIREMENTS.
- 3.3 TESTING WATER CONTROL SYSTEMS
- 3.4 LOCATION OF WATER CONTROL WELLS
- 3.5 DRILLING
  - 3.5.1 General
  - 3.5.2 Reverse Rotary Method.
  - 3.5.3 Bucket-Auger Method.
- 3.6 DEPTH OF WELLS, SCREENS, AND FILTER.
  - 3.6.1 Wells in Coffercells, Arcs, and Binwall.
  - 3.6.2 Wells in 360 Nose Pier.
- 3.7 ASSEMBLY AND INSTALLATION OF WELLS
  - 3.7.1 Assembly of Screen and Riser Pipe.
  - 3.7.2 Installation
  - 3.7.3 Alignment
  - 3.7.4 Placement of Sand Filter
  - 3.7.5 Development of Wells.
  - 3.7.6 Disinfection of Drill Hole and Filter Sand.
- 3.8 PUMPING TEST ON EACH WELL.
  - 3.8.1 Resurging Test Pump.
  - 3.8.2 Abandoning Well.
  - 3.8.3 Sand Removal Upon Test Completion.
- 3.9 PUMPING AND WATER LEVEL CONTROL
- 3.10 WATER CONTROL ELECTRICAL SYSTEM
- 3.11 MONITORING WATER CONTROL SYSTEMS
  - 3.11.1 Water Levels.
  - 3.11.2 Well Flow.
  - 3.11.3 Sanding.
- 3.12 OPERATION AND MAINTENANCE
  - 3.12.1 Supervision
  - 3.12.2 Operating Personnel
  - 3.12.3 Repair and Replacement
  - 3.12.4 Maintenance
- 3.13 GROUNDWATER PROTECTION PLAN

-- End of Section Table of Contents --

## SECTION 02130

## CONTROL OF WATER

## PART 1 GENERAL

## 1.1 GENERAL REQUIREMENTS

This Section covers the work for removing and/or controlling all water required for keeping the cofferdam dry for the duration of the contract. The work also includes controlling any seepage through or beneath the coffercells, from the Kentucky bank, through or under the existing 1200' lock south wall, through the embankment between the 1200' lock south wall, and through or under the 360' nose pier, not intercepted by the water control systems; reducing the artesian head that may exist in the foundation bedrock that underlies the cofferdam; and lowering the water level in the coffercells, the upstream sheetpile binwall, and the 360 lock nose pier. The work required herein consists of furnishing all plant, labor, material, and equipment and performing all operations required for operating, maintaining, and supplementing (if necessary) the water control systems previously installed consisting of:

- a. Wells, pumps, and discharge pipes for lowering the water level in the coffercells, upstream sheetpile binwall, and 360 lock nose pier.
- b. Ditching, seeding, sandbagging and sump pumping to control surface water within the cofferdam so that the permanent work can be accomplished in the dry and free of the inwash of mud.

A water control system has been previously installed. The purpose of the existing system is to lower the water levels in the cofferdam cells, binwalls, 360 nose pier, and to relieve uplift acting on these structures. The Contractor shall be responsible for designing and installing additional measures necessary to maintain a dry cofferdam. This will include the control of rainfall and runoff into the cofferdam, seepage under and through cells, binwalls, nose pier, lock walls and soil slopes. The Contractor shall review and inspect the installed system and evaluate all available data. The Contractor shall be responsible for operation and maintenance of the existing systems and for operations and maintenance of whatever supplemental water control measures are necessary. Maintenance of the system will require maintaining all components of the system operating at the design performance levels. If any supplements or replacements are ever required they must be installed as specified herein and as directed or approved by the Contracting Officer. Some sections of this specification are only applicable to new installations.

## 1.1.1 Cofferdam

The cofferdam consists of two arms of steel sheet piling cells, the existing 1200' lock south wall, embankment between 1200' lock south wall and 360' nose pier, a portion of the 360' lock nose pier, an upstream and downstream binwall, and the Kentucky bank as shown on the drawings. Cell



## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

9.5, a portion of Cell 10, Cell 12, and a portion of Arc 15.5 are concrete filled, as is the area between Cell 9 and the 360' lock nose pier. The in-situ material remains in the lower portion of Cell 16. The remaining cells and bin walls are filled with granular material, and a berm has been constructed inside the cofferdam to augment the stability of the cofferdam.

The water control system will improve the stability of the cofferdam, reduce tension stresses in the interlocks of the cells and arcs, and relieve any uplift that may occur in the foundation bedrock underlying the cells.

#### 1.1.2 Water Control in Coffercells

Wells have been installed in the circular cells and arcs. Wells shall be pumped to lower the water level in the cells to elevation 410 upstream, and 385 downstream, or the water level shall be within 5 ft of the bottom of the sand fill in cell 16, arc 15.5, and the upstream binwall. The elevation of the water level in these structures shall be determined from as-built well records.

#### 1.1.3 Water Control in Upstream Binwall

Wells have been installed in the upstream binwall of the cofferdam to lower the water level in the wall fill to El 410 or the water shall be within 5 ft. of the bottom of the sand fill in the bin wall, whichever is higher.

#### 1.1.4 Water Control in 360 Nose Pier

Wells have been installed in the center of the 360 lock north nose pier to lower the water level and collect any seepage through the masonry pier. Wells shall be pumped to lower the water level in the masonry pier to less than El 402.

#### 1.1.5 Monitoring and Testing Water Control Systems

Piezometers have been installed to monitor the water level and hydrostatic head around the cofferdam, along the Kentucky bank, in the coffercells, in the upstream and downstream binwalls, and in the 360 nose pier. Supplemental or replacement instrumentation shall be installed in accordance with sections 13500 INSTRUMENTATION PROGRAM and 13503 PIEZOMETERS of the specifications. Supplements to the water control wells are to be tested for performance as they are installed.

### 1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

STATE OF KENTUCKY

KAR

Kentucky Administrative Regulations

### 1.3 REQUIRED WATER CONTROL FACILITIES

The systems that have been installed are the required water control

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

facilities consisting of wells in the coffercells, binwalls, and nose pier, pumps and discharge pipes, piezometers, electrical and standby equipment, and flow measuring equipment. The Contractor shall accept this system and operate and maintain it as necessary to perform as required. It is not intended nor is it warranted that the minimum required facilities previously installed will remove or control all water as required by this specification. It is the Contractor's responsibility to control all water as specified herein even though the number, size, type, and components of the water control facilities may be more than those previously installed. If any additional facilities are required for the control of water, or if any monitoring systems are required in addition to those already installed, the Contractor shall include such additional features at no additional cost to the Government and without any extension of contract time. The Contractor shall also be responsible for design and construction of any supplemental dikes and drainage ditches needed to prevent any water from entering the protected area from the slope along the Kentucky bank and to collect and remove any seepage under or through existing structures. The Contractor is also responsible for winter protection of the discharge lines.

The existing water control system for control of water in the cofferdam cells, arcs, 360' lock nose pier and binwall consist of water wells with pumps controlled by a Variable Frequency Drive (VFD) system. The following is a VFD - Pump Controller Supply Organization Chart of the equipment in place:

Installer - Jensen Drilling Company  
Supplier - United Pipe & Supply  
Pump Manufacturer - Grundfos  
Controller Manufacturer - Fuji  
Drive Manufacturer - AC Technology  
Assembly - Electro Pak

#### 1.4 DEFINITIONS

##### 1.4.1 Foundation Bedrock

The foundation bedrock underlying the cofferdammed area referenced in these specifications consists of four separate and distinct rock formations. These formations, in descending order of contact, consist of New Albany Shale, Beechwood Limestone, Silver Creek Limestone, and Jeffersonville Limestone. Due to multiple generations of previous construction, not all of these formations are present everywhere on the site.

##### 1.4.2 Replacement Systems

Replacement systems are defined as the in-kind replacement of existing wells in the cells, arcs, binwall and 360' nose pier required to control the water levels and relieve uplift in these structures.

##### 1.4.3 Supplemental Systems

Supplemental systems are defined as the installation of additional wells and/or pumps and associated features required to control seepage under or

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

through the structures and slopes which comprise the cofferdam, through the foundation bedrock, or entering the excavation as rainfall or runoff.

#### 1.4.4 Pressure Reduction

Pressure reduction is defined as a means of reducing the artesian head or hydrostatic uplift pressure on the cofferdam foundation.

#### 1.4.5 Water Control

Water control as referred to in this section is defined as the control of the water levels in the cofferdam cells, arcs, and 360 nose pier, and the control of all water entering the cofferdam through or under the structures comprising the cofferdam, from runoff, from direct rainfall, or from any other source which introduces water into the cofferdam with the exception of controlled rewatering.

#### 1.4.6 Unwatering

Unwatering is the process of removing all water from within the cofferdam after emergency flooding. Unwatering is covered in specification Section 02170 COFFERDAM.

#### 1.4.7 Cofferdam

The cofferdam consists of the entire area bounded by the upstream and downstream coffercells and binwalls, the North wall of the old 1200' lock, and the south Kentucky bank, in which area the new lock is to be constructed.

#### 1.4.8 Emergency Flooding

Emergency flooding is defined as the controlled process of filling the cofferdam with water from the Ohio River at a rate specified by the Contracting Officer. Emergency flooding is covered in specification Section 02170 COFFERDAM.

### 1.5 PAYMENT

#### 1.5.1 Operation and Maintenance

Payment for operating and maintaining the water control system as outlined in this section will be included in the contract unit price per day for "Operation and Maintenance of Completed Work, (Including Power, Maintenance, Monitoring, and Repair for all Water Control, Instrumentation, and Other Completed Work)" as specified in the Bid Schedule. This daily rate shall constitute full compensation for furnishing all labor, equipment and supplies for operating and maintaining the water control system. This includes but is not limited to; furnishing system performance data, rehabilitation of pumps, redevelopment of wells, grouting abandoned wells, or other work as necessary to maintain the specified dewatered condition. Payments based on the daily contract unit price will begin at the beginning of the contract period. Payments at the contract unit price will continue to be made for the total balance of the contract period as extended by the

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

Contracting Officer for excusable delays until the the lock is complete and the cofferdam rewatered, or as directed by the Contracting Officer. The Contractor shall fully perform but shall not be compensated for any periods of delay determined by the Contracting Officer to be inexcusable. In the event it becomes necessary to flood the cofferdam, a revised unit price per day shall be negotiated with the Contracting Officer for the period between initiation of emergency flooding through the completion of the unwatering process.

## 1.6 SUBMITTALS

Government approval is required for submittals with a ``GA'' designation, submittals having an ``FIO'' designation are for information only. The following shall be submitted in accordance with Section 01335 SUBMMITTAL PROCEDURES:

SD-01 Data

Water Control Plan; GA,ED.

The Contractor shall prepare, and submit for review, a detailed plan for installation, testing, operation, and maintenance of the water control and electrical systems. This plan shall be based on the Contractor's own assessment of site and subsurface conditions, and the installation and operation records from system that has been installed. The records for the installed systems shall be obtained from the cofferdam dewatering contractor as specified herein. The plan shall include the following, in addition to any requirements specified elsewhere.

The plan shall contain:

- 1) Locations of all water control wells.
- 2) Depth of all water control wells.
- 3) Method(s) for installing the coffercell, binwall, and 360 nose pier wells.
- 4) Number, type and specifications for drilling equipment.
- 5) Type, size, slotting, area of slots, and method of coupling screen and riser pipe to be used for the water control wells.
- 6) Source, gradation, and samples of filter material to be used for the various water control wells and piezometers.
- 7) Piping and valving to be used at the top of the cofferdam for measuring both flow and (any) sanding of the individual wells.
- 8) Methods for protecting the water control wells, header pipe, and electrical wiring and controls.
- 9) Plan and design of electrical systems for the water control wells, including wiring controls, switches, and automatic transfer switching to standby power generators, and for testing.
- 10) A coordination/short circuit study for the proposed electrical system.
- 11) Brand, type, size, and characteristics of submersible pumps to be installed in the water control wells.
- 12) Name, model, and description of water level sensor and pump speed or flow controller.
- 13) Type, number, and capacity of standby diesel generators (including automatic starting and switching equipment).

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

- 14) Proposed schedule and sequence for installation of the various water control systems.
- 15) Name and qualifications of the dewatering superintendent.
- 16) Method of measuring well flow data.
- 17) Layout of piezometers for checking performance of the water control system.
- 18) Method for reading piezometers and recording the data.
- 19) Typical detail of tip and riser pipe for piezometers.
- 20) Gradation of filter sand to be placed around piezometer tips.
- 21) Calibration records, make, and characteristics of flow meters for measuring discharge from water control wells.
- 22) Dikes and ditches to prevent surface water from flowing into the cofferdammed area.
- 23) Location and size of sumps.
- 24) Characteristics of sump pumps and horsepower of engines or motors.
- 25) Location, type, and size of discharge piping. (No surface water shall be pumped into the discharge for the cofferdam cell, arc, binwall, and 360 nose pier water control wells.)
- 26) Protection of slopes and stability berms from erosion.
- 27) Method, and type, number, and capacity of pumps for unwatering the cofferdammed area.

## SD-18 Records

## Test Records; FIO.

A copy of all inspection and test data relating to operation, maintenance, and performance of the water control systems, and any required supplemental water control facilities, shall be furnished to the Contracting Officer within 24 hours after the inspection or test is completed. During the initial testing and evaluation pumping, copies of test data shall be furnished to the Contracting Officer at the end of each day. The Contractor shall provide the Government with all significant operational, maintenance, and performance data and records. Any changes to the water control system shall be furnished to the Contracting Officer within five days for incorporation into the records.

## Well Records; FIO.

When supplemental or replacement systems are installed, the Contractor shall record the following information regarding the installation of each well on a suitable form.

- 1) Water Control System (coffercell, binwall, or 360 nose pier)
- 2) Well number
- 3) Drilling method
- 4) Date of installation
- 5) Well screen (brand, material, diameter, schedule, and slot size)
- 6) Drilling superintendent
- 7) Ground or surface elevation at well
- 8) Depth to top of foundation bedrock
- 9) Groundwater table elevation
- 10) Riser pipe length
- 11) Screen length

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

- 12) Total depth of hole for well
- 13) Inside depth of well (from top of well riser)
- 14) Depth to sand in well after cleaning
- 15) Top of well screen [Ohio River Datum (ORD)]
- 16) Top of filter after placing (ORD)
- 17) Top of filter after development of well (ORD)
- 18) Top of seal after placing (ORD)
- 19) Top of seal after development of well (ORD)
- 20) Bottom of well (ORD)
- 21) Top of well (ORD)
- 22) Method of surging
- 23) Material surged into well (last cycle) in feet
- 24) Total material surged into well in feet

Pumping Test Records; FIO.

The Contractor shall submit for the individual pumping test on any supplemental or replacement well the following information:

- 1) Water Control system (coffercell, binwall, or 360 nose pier)
- 2) Well number
- 3) Location
- 4) Top of riser (ORD)
- 5) Date and time test started and stopped
- 6) Depth of water in well before and just before stopping pump
- 7) Elevation of water in well immediately before and just before stopping pump
- 8) Flow in g.p.m.
- 9) Rate of sand infiltration at the end of test in ppm
- 10) Depth of sand in well before and after pumping is completed
- 11) Depth of sand in well after cleaning
- 12) River stage
- 13) Rate of pumping and drawdown
- 14) Total pumping time
- 15) Rate of sand infiltration at the end of pumping in ppm

Water Control System Data Reports; FIO.

Water control system data shall be recorded as specified in paragraph 3.13.1. The data Water control system data shall be reported along with the instrumentation data as specified in section 13500 INSTRUMENTATION PROGRAM.

#### 1.7 CONTRACTOR RESPONSIBILITY

The Contractor shall be responsible for:

- 1) Operating and maintaining the performance of the water control systems for the coffercells, upstream binwall and 360 nose pier. The systems shall be kept in their original condition, until all work in the cofferdam is complete and the cofferdam is rewatered. This will require 24-hour monitoring and should be accounted for in the subcontractor's bid. The Contractor shall be responsible for the installation, operation, and maintenance of any supplemental or

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

replacement systems installed under the direction of the Government.

2) Design, installation, maintenance, and operation of all necessary sump pumps and appurtenances for water control. Maintenance and operation of pumps for the water control wells; electrical distribution system; stand by equipment and spare parts; and appropriate controls and safeguards; all in accordance with the Contractor's approved Groundwater Control Plan.

3) Any additions and supplements that may be required to lower the water levels as specified or control any seepage from excavated slopes or into the bottom of the excavation to permit accomplishing the work in the dry. Supplemental measures may include the installation of wellpoints, inverted filters, French drains, and/or installation of additional wells, and appropriate pumps, piping, and appurtenances as necessary. Any additions and supplements installed shall become part of the existing water control system and shall be operated and maintained by the Contractor.

4) Monitoring the performance of the water control facilities.

5) Repairing all damage to work and to excavated areas caused by failure to maintain and operate the water control systems as specified.

6) Maintaining the electrical system, switching, and standby equipment for powering the pumps in the water control wells and for the sump pumps (if not powered with diesel engines).

7) Designing any features control systems not specifically covered by these specifications or drawings and including such in the Contractor's Water Control Plan.

8) Prior to the installation of any supplemental or replacement systems, the Contractor shall demonstrate that higher than specified piezometric levels are not the result of poor performance of the water control system due to operation and/or maintenance.

9) A meeting shall be arranged between the existing contractor and the new contractor to allow for proper turnover of equipment. This meeting shall consist of a demonstration and walk-through of all the equipment to acknowledge the condition it is in for turnover and to discuss any problems or procedures as identified by the existing contractor relating to the system. Minutes of the meeting shall be taken by the lock contractor and include any pretakeover survey problems that may need to be taken care of under warranty of the existing contractor. It should also consist of a list of all equipment and components to be received by the new Contractor. Any concerns about the transition of the existing equipment should be brought up at this time. The cofferdam contractor and the lock contractor shall coordinate the turnover so that the system is continuously operated and maintained.

Any noncompliance with the above specified groundwater control requirements or with the Contractor's approved Water Control Plan shall be promptly rectified in accordance with these specifications.

## 1.8 QUALIFICATIONS AND DUTIES OF CONTRACTOR

### 1.8.1 General

The Contractor shall engage the services of an experienced dewatering Subcontractor to perform maintenance and installation of the water control system. The subcontractor shall have at least five years of responsible

experience in the design, installation, and operation of dewatering systems for deep locks and dams built in major alluvial valleys. The dewatering subcontractor shall have appropriate equipment for installing piezometers and dewatering wells by the reverse-rotary, or bucket auger methods, as appropriate for conditions at this site. Equipment suitable for penetration of sound and continuous bedrock will be required. The Subcontractor shall also be experienced in the design and installation of electrical systems and controls for the pumps to be installed in the wells.

#### 1.8.2 Dewatering Superintendent

The Contractor shall designate and have on site a Dewatering Superintendent with at least three years of responsible experience in the installation of water wells and dewatering system. The Qualifications of the Dewatering Superintendent shall be submitted with the Water Control Plan in accordance with Paragraph 1.6 SUBMITTALS. The Dewatering Superintendent shall be responsible for ensuring that the water control and electrical systems are installed in compliance with the Contractor's approved Water Control Plan with respect to materials, testing, operation, and maintenance of the systems and that the water levels in the cells, arcs, 360' nose pier and binwall are controlled as specified herein. The Dewatering Superintendent's duties shall also include, but not be limited to, those described below.

##### 1.8.2.1 Materials and Equipment

The Contractor's Dewatering Superintendent shall supervise all tests and/or measurements to determine that all materials incorporated in the work are in accordance with the drawings and specifications and with the Contractor's approved Water Control Plan. Materials and equipment to be checked shall include, but not be limited to, drilling equipment, well screens, riser pipes, filter sand, pumps, diesel generators, automatic starting and power transfer equipment, well discharge pipe and fittings, header pipe, valves, discharge outlets, piezometers, water level controllers in the wells, flow measuring equipment, and related materials and equipment.

##### 1.8.2.2 Installation

The Contractor's Dewatering Superintendent shall personally verify that specified and/or approved procedures and methods for installing any wells, pumps, piezometers, headers, electrical systems, and any replacement or supplemental water control facilities are followed.

##### 1.8.2.3 Operation and Maintenance

The Contractor's Dewatering Superintendent shall supervise the operation and maintenance of all installed water control systems, electrical systems, replacement and supplemental water control facilities. The Dewatering Superintendent shall also regulate the rate of pumping the water control wells so that a constant water level is maintained in the wells. He shall obtain all required river stage, piezometric, well performance, and flow data for and during the specified pumping and evaluation tests, and as required during construction monitoring. The Contractor's Dewatering Superintendent shall also inspect the test-starting of each nonoperating



## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

pump and diesel generator weekly (including the backup diesel generator) and include, in a daily report, reference to the conduct of the test, the number of pumps and diesel generators tested, any unsatisfactory performance data, and any remedial action taken. The Contractor's Dewatering Superintendent shall immediately notify the Contractor, and the Contractor shall immediately notify the Contracting Officer, concerning any event or information not in accordance with either these specifications or the approved Water Control Plan.

## 1.8.2.4 Quality Assurance

The Contracting Officer shall have access to and the right to inspect any equipment and supplies provided in connection with installing the water control system, and to inspect installation, operation, maintenance, and performance of such systems.

\*1

## 1.9 INSTALLED SYSTEM

All information in this section is based on preconstruction data. More current data are available from installation and operating records for the installed system **including the specific sizes, locations, and quantities of installed equipment, spare parts, and electrical distribution equipment** at the McAlpine Resident Engineers Office, 2750 Marine Street, Louisville, KY 40212.

\*1

## 1.9.1 Subsurface Data

Subsurface boring logs are shown on the drawings. The design memorandum and remaining samples of materials taken from subsurface investigations may be examined by appointment by contacting the Geotechnical and Dam Safety Section of the Louisville District (Phone 502-315-6445). Prospective bidders are encouraged to examine all available data. Because of the nature and volume of this material, the data must be examined at the Louisville District Office. These data represent the best subsurface information available; however, variations may exist in the subsurface between boring locations. Portions of the McAlpine project date to the 1850's and the site conditions have been impacted by multiple generations of construction. The reports, plates, and data made available for inspection are solely for general information purposes. Most of the borings were made with a hollow stem auger and split-spoon sampler. Generally, the alluvial sand could be penetrated to foundation bedrock with the augers used. Many boring logs shown on the drawings are based on samples taken with 1-3/8-in. I.D. split-spoon samplers capable of only recovering gravel or stones smaller than about 1 in. The fact that the boring logs do not show the existence of gravel or cobbles does not necessarily mean that these materials are absent at or between the borings. Wherever any difference occurs between the referenced reports and these specifications, the requirements of these specifications control.

## 1.9.2 Subsurface Conditions.

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

The cofferdam floor is comprised of foundation bedrock consisting of New Albany Shale, Silver Creek Limestone, Beechwood Limestone, and Jeffersonville Limestone. A contour map of the surface of the foundation bedrock in the area of the locks is shown in the drawings. This map was developed prior to cofferdam unwatering and these contours should be considered approximate.

### 1.9.3 Chemical Characteristics of River Water

The chemical characteristics of the river water, based on samples of water taken from the river near McAlpine, are given in the following tabulation.

#### CHEMICAL CHARACTERISTICS OF GROUNDWATER

River Mile	602.0
Date Sampled	1998 Average
pH	7.9
Temperature	63.2 F
Total Hardness (CaCO <sub>3</sub> )	150.7
Total Calcium	40.1 mg/l
Total Magnesium	12.0 mg/l
Total Sodium	20.6 mg/l
Chloride	33.3 mg/l
Sulfate	61.0 mg/l
Total Iron	1.6 mg/l
Total Manganese	0.1 mg/l

### 1.9.4 Pumping Test

A pumping test has not been performed at this site. It shall be the responsibility of the Contractor to make his own evaluation of the relation of the boring records and laboratory data to the general subsurface conditions at the site.

## PART 2 PRODUCTS

### 2.1 General

The product requirements as set forth herein represent minimum product specifications. The products for replacement of existing systems shall be in-kind.

### 2.2 WELL TOPS AND PROTECTION OF WELLS

The tops of wells shall be temporarily sealed immediately after completion of installation with a PVC cap that shall be kept in place at all time, except during cleaning and pumping operations. Each well shall be protected with three 4-in. standard weight steel pipes 5 ft long set 30 in. deep in an 2-ft. diameter concrete filled hole. These guard posts shall be sandblasted, primed, and painted Day-glow orange for ready visibility, and the number of the well painted thereon in 2-in. high block numerals. Any

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

damage to a well during or after installation shall be repaired within 72 hours.

## 2.3 SUBMERSIBLE PUMPS AND WIRING.

\*1

It shall be the responsibility of the Contractor to provide new submersible pumps **for any additional spare pumps or any pumps installed** under this contract. The pumps installed shall have new fittings, as described below:

\*1

a. A water level controller for each pump in each of the wells to maintain the water level in the well constant (1 ft.) and to prevent surging and air from entering the pump bowl to minimize incrustation. The water levels within the wells may be controlled by varying pump speed using a variable speed controller. The controller shall be set to control the water level in the wells at the following elevations:

Well	Design Water	
	Level in Well (Elevation)	Pump Intake (Elevation)
Upstream Cell	410	397
Upstream Arc	410	397
Upstream Binwall	410	397
360 Nose Pier	402	397
Downstream Cell	385	367
Downstream Arc	385	367

b. Pumps for wells shall be fitted with a PVC or approved metal shroud attached to the pump bowl and extending to the bottom of the electric motor. The shroud must be connected so that all flow will pass by the motor.

c. Each submersible pump shall be provided with a check valve.

d. All electrical wiring and controls for the pumps shall be new and waterproof.

## 2.3.1 Submersible Pump Capacities

The submersible pumps in the existing system have the following minimum capacities for the different water control wells. Replacements shall be in kind. Minimum pump capacities may be modified based on development tests and as approved by the Contracting Officer.

Upstream coffercell wells,  $Q_w = 20$  gpm and TDH = 65 ft  
 Upstream arc wells,  $Q_w = 30$  gpm and TDH = 65 ft  
 Upstream binwall wells,  $Q_w = 20$  gpm and TDH = 65 ft  
 360 Nose pier wells,  $Q_w = 20$  gpm and TDH = 65 ft  
 Downstream coffercell wells,  $Q_w = 75$  gpm and TDH = 85 ft  
 Downstream arc wells,  $Q_w = 105$  gpm and TDH = 85 ft

## 2.4 DISCHARGE SYSTEM.

Water from the water control wells may be pumped into the Ohio River, as shown schematically on the drawings. The minimum discharge system shall have an additional 50% capacity over that required for the initially installed system. The discharge system shall be provided with valves that permit disconnecting the pump for each well individually without interfering with pumping from any other wells. The discharge piping shall be new, and shall be steel with a wall thickness of at least 0.188 inches. All discharge pipe and fittings shall be of a size so that the total friction losses in the discharge and header pipes for any pump do not exceed 15 ft to 20 ft for the design flow rates for the wells. The discharge system shall be constructed with threaded couplings on the discharge line to make future removal operations easier. All discharge and/or header pipes shall be protected from damage that could be caused by construction equipment or operations.

## 2.5 MATERIALS OTHER THAN PUMPS AND DISCHARGE SYSTEM.

### 2.5.1 Riser Pipes.

The riser pipe for the wells shall be 8-in. in diameter and shall be Sch. 40 PVC minimum.

### 2.5.2 Screen.

The screens for the wells shall be new and shall be slotted with 0.015-in slots with at least 5 percent of open area. The screen section of the water control wells shall extend down to within 2 ft to 3 ft of the bottom of the well. The approximate length of screens for the dewatering wells shall be as follows:

Upstream Cell Wells - 25 ft (see Para 3.7)  
Upstream Arc Wells - 25 ft (see Para 3.7)  
Upstream Binwall Wells - 25 ft (see Para 3.7)  
360 Nose Pier Wells - 25 ft (see Para 3.7)  
Downstream Cell Wells - 58 ft (see Para 3.7)  
Downstream Arc Wells - 58 ft (see Para 3.7)

### 2.5.3 Filter Sand.

Filter sand around the well screens shall be a washed, clean, uniformly graded sand composed of hard, tough, and durable particles free from any adherent coating. The filter sand shall contain no detrimental quantities of organic matter, nor soft, friable, thin, or elongated particles; it shall be uniformly graded; and shall fall within the following gradation requirements:

FILTER SAND GRADATION  
FOR  
WATER CONTROL WELLS

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

## U.S. Standard

Sieve No.	Percent by Weight Passing
1/4	90 - 100
4	75 - 100
8	30 - 72
10	22 - 60
16	8 - 27
20	0 - 15
30	0 - 7
40	0 - 2
50	-
70	-

The coefficient of uniformity of the filter sand shall range from 2.5 to 6.

## 2.6 SPARE PARTS.

\*1

**The Contractor will be provided the minimum inventory of spare parts for the installed system as listed below.** The Contractor shall maintain the following minimum inventory of spare parts in first class condition at the site at all times. The minimum inventory shall also include spare parts for any supplemental systems installed.

\*1

Discharge Piping and Fittings: 5% of all pipe and fittings within the system;

Submersible Pumps: At least 5% of complete pump, motor, and necessary electrical switch gear (disconnect switches), magnetic starters, and miscellaneous electric fittings;

Standby diesel generators: One (1). The generator shall be equipped for replacement within 2 hours of main generator failure.

Flow meters for measuring flow from water control wells, if installed for this purpose: Five (5)

Miscellaneous: Ample supply of fuses, electrical wire, electrical fittings, PVC fittings, and other miscellaneous components of the system.

## PART 3 EXECUTION

## 3.1 GENERAL.

The water control systems for the coffercells, binwalls, and 360 nose pier shall be installed, operated, and maintained by the Contractor to lower the piezometric level in the coffercells and provide pressure relief to the foundation bedrock, as specified herein. Surface water and seepage from any slopes, under or through existing structures, through the cofferdam foundation, or into the bottom of the excavation, shall also be controlled so that construction inside the cofferdam can be accomplished in areas free of water.

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

## 3.2 CONTROL REQUIREMENTS.

Control of water to be performed by the Contractor shall consist of:

- \* Lowering the piezometric levels as follows:
- \* Coffercells - Lower the water level in the cells and arcs to El 410 upstream, and 385 downstream, or within 5 ft of the bottom of the sand fill in coffercells.
- \* Binwall - Lower the water level in the upstream binwall to less than El 410, or within 5 ft of the bottom of the sand fill in the binwall.
- \* 360 Nose Pier - Lower the water level in the 360 nose pier to less than El 402.
- \* Testing electrical systems and standby generators, including automatic startup and transfer of power, for proper performance.
- \* Testing the water control systems for mechanical and electrical performance after flooding before beginning to unwater the cofferdammed area.
- \* Preventing erosion of excavated slopes along the Kentucky bank from any seepage by means of filter blankets, toe drains, or other measures for controlling seepage.
- \* Preventing erosion of stability berm slopes and excavated slopes as a result of surface runoff by constructing intercepting dikes, seeding, stone slope protection, and/or other approved means.
- \* Providing adequate sump pumping equipment to promptly remove rainfall falling or flowing into the cofferdammed area.
- \* Preventing surface water at the top of the south Kentucky bank from flowing into the excavation, by diking, sump pumping, or other approved means.
- \* Providing supplemental measures necessary to control the seepage of water from the soil slopes, through and under existing cofferdam structures and from the foundation bedrock.
- \* Monitoring construction piezometers and replacing or supplementing as necessary to prove the adequacy of the water control systems.
- \* Operating and maintaining the water control systems shall be continued until the lock construction is complete and the cofferdam is rewatered.

The Contractor shall operate, maintain, and supplement as necessary dikes, ditches, sumps, pumps, and discharge piping for controlling surface water that falls or accumulates from any source to prevent flooding of the work area or excavation. The systems or features for controlling surface water shall be designed with sufficient storage and pumping capacity to prevent any significant flooding of the excavations for the following rainfall periods, assuming 100 percent runoff:

Rainfall	
Period	Amount (inches)
30 minutes	1.25
1 hour	2.0
2 hours	2.50

In any event, the Contractor shall be responsible for controlling whatever surface runoff occurs, regardless of rainfall intensity and duration, and protecting the work area. The methods and equipment to be used shall be detailed in the Contractor's Water Control Plan. Proper procedures for handling this water must be submitted for approval prior to discharging water from the excavation and shall be in accordance with KPDES storm water permit #KYR000001 and the Water Quality Certification issued by the Kentucky Department for Environmental Protection, Division of Water, certification #2000-0118-1. As required by the Water Quality Certification, all water pumped from construction areas must be treated to remove settleable solids prior to discharge to the Ohio River. The Water Control Plan shall describe the method that will be used to remove settleable solids from the water prior to discharge. Settled solids shall not be pumped into the Ohio River.

Under no circumstances shall the Contractor discharge water from the cofferdam to a surface water (Ohio River) if a sheen is present on the water, or if the discharge may create a sheen on surface water after discharged. The Contractor shall describe measures that it will implement for the disposal of cofferdam water in the event that sheening is an issue, i.e. treatment to remove sheen prior to discharge or arrangements for alternate disposal of the water.

### 3.3 TESTING WATER CONTROL SYSTEMS

In the event the cofferdam is flooded, all components of the water control system shall be made fully operational prior to unwatering. After proving the mechanical and electrical performance of the water control systems, all of the systems shall be put into operation and monitored in accordance with Para 3.11, MONITORING WATER CONTROL SYSTEMS. Once unwatering of the cofferdammed area is started, the water level in the coffercells shall be kept lowered in accordance with the requirements set forth in Para 3.2, CONTROL REQUIREMENTS.

### 3.4 LOCATION OF WATER CONTROL WELLS

The water control system has been installed at approximately the locations shown in the drawings. Any supplemental wells considered necessary by the Contractor shall be located as shown on the Contractor's approved Water Control Plan.

### 3.5 DRILLING

#### 3.5.1 General

Drilling for the water control wells shall be performed by a certified driller in accordance with the Kentucky Department of Environmental Protection, Division of Water regulations. Certification shall be in accordance with 401 KAR 6:310 through 401 KAR 6:320. Refer to Section 01410, Environment Protection, paragraph 3.6.2 for additional requirements pertaining to submittal of water well record forms to the Kentucky Department for Environmental Protection, Division of Water. Drilling the holes for the water control wells shall be carried out to prevent any appreciable displacement of the materials adjacent to the hole or any

reduction in the yield of the well. With the exception of the holes in the 360 Nose Pier, the holes for the water control wells will be started in cell fill material, setting a temporary surface casing before the start of drilling to prevent the top of the hole from caving will probably be necessary while drilling for the well. The Contractor shall accurately log the surface of the foundation bedrock while drilling the holes for the water control wells, and the logs promptly made available to the Contracting Officer. This information is necessary for determining and setting the screen for the wells to be installed in the water control wells. If obstructions are encountered which the Contractor considers impractical to advance the drill hole to the design depth for the well, the Contractor may abandon the well and construct another well at an adjacent location approved by the Contracting Officer, at no additional cost to the Government and with no extension in contract time. Abandoned wells shall be backfilled with granular material conforming to the gradation of cell fill in Specification Section 02170 COFFERDAM. The water control wells shall be installed using one or a combination of the following methods and no others. Soils including cell fill shall be drilled using the reverse rotary method, and approved bucket auger and procedure. Bedrock shall be drilled using rotary, percussive, cable-tool, or coring procedure. The drilling equipment used must be capable of penetrating the bedrock formations at the site. Regardless of the method used for installing the wells, the method of developing and test pumping the wells shall be the same. Water used for jetting or as makeup water for the reverse-rotary or bucket auger method of drilling shall be relatively clear water such as can be obtained from the Ohio River or by pumping from other wells previously installed. Because of the different types of materials to be penetrated by the water control wells, different types of equipment and drilling methods may be required for installing the water control wells. The drilling methods used shall be capable of advancing holes through the cell fill material as specified in Section 02170 COFFERDAM, and through the cell foundations.

#### 3.5.2 Reverse Rotary Method.

The reverse rotary method for installing the wells shall consist of drilling the hole with a bit attached to (typically) a 6- or 8-in. drill stem and sucking the cuttings from the bit out of the hole by means of a high-capacity dredge pump, an airlift pump, or a jet-eductor pump. For the reverse rotary method of drilling, water from the pump is recirculated through a sump from which the drilling water flows back into the drilled hole. Material removed from the hole settles out in the sump. For this method of drilling, the water level in the hole shall be maintained at least 7 ft above the existing river level at all times until the well screen, riser pipe, filter, and backfill have been placed. The hole drilled for the well shall be at least 20 in. in diameter to permit the use of a bit with 5-in. openings to minimize difficulties cell fill that may be encountered. While drilling and installing the well, the drill hole shall be kept full of natural drilling fluid with turbidity (suspended solids) of about 3,000 ppm up to the ground surface. No bentonitic drilling mud shall be used while drilling or installing the well. Silt may be added to the drilling water to obtain the desired degree of turbidity, if necessary. If naturally turbid water, or water with silt added, proves insufficient to keep the hole stable, an approved organic drilling compound, such as



## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

Johnson's Revert or equal, may be added to the drilling fluid. Regardless of the type of fluid used, the Contractor shall use a sump pit large enough to allow the sand to settle out but small enough so that some silt is kept in suspension. If Revert drilling fluid is used in drilling the hole for a well, all drilling fluid in the hole shall be replaced with clean, fresh Revert with a Marsh funnel viscosity of 32 to 45 seconds, before setting the well screen and placing the filter. All drilling fluid shall be removed from the well filter and the subsurface formations by development after the well is installed.

### 3.5.3 Bucket-Auger Method.

Any holes drilled by the bucket-auger method shall be drilled with water with turbidity less than 3000 ppm. The bucket-auger shall be fitted with sharp curved blades or equal that will trim the sides of the hole as the hole is advanced as approved by the Contracting Officer. The top of the hole shall be cased (a minimum of 5 ft to 10 ft) to prevent caving at the top of the hole. For this method of drilling, the water level in the hole shall be maintained at least 7 ft above the water level at the well until the well screen, riser, filter, and backfill have been placed. If clay or silt exists above the portion of the well to be screened, the drilling fluid, if muddy, shall be replaced with clear water or thinned with clear water to turbidity less than 1000 to 2000 ppm, prior to drilling into the zone where the well will be screened. If a drilling fluid additive is required, only approved organic polymers, such as Johnson's Revert or equal, shall be used. Before installing the well screen, the drilling fluid in the hole shall be replaced with clean drilling fluid or thinned with clear water by an approved method to a turbidity of less than 1000 to 2000 ppm. No bentonitic drilling fluid shall be used.

### 3.6 DEPTH OF WELLS, SCREENS, AND FILTER.

#### 3.6.1 Wells in Coffercells, Arcs, and Binwall.

The wells for lowering the water level in the coffercells, arcs, and upstream binwall shall extend from the top of the cells down 5 feet into the limestone bedrock, approximately El 385 upstream, and approximately El 362 downstream. These wells shall consist of riser pipe from the top of the cofferdam down to El 420 +/- 3 ft with screen down to the bottom of the well. The filter for the wells shall extend from 2 ft or 3 ft below the bottom of the screen to 6 ft to 8 ft above the top of the screen. Above this elevation, the space between the well riser and hole or casing shall be filled with either filter sand or any locally available clean fine sand.

#### 3.6.2 Wells in 360 Nose Pier.

The wells for lowering the water level in the 360 Nose Pier shall extend from the top of the pier down 5 feet into the limestone bedrock, approximately El 385. These wells shall consist of riser pipe from the top of the pier down to El 420 +/- 3 ft with screen down to the bottom of the well. The filter for the nose pier wells shall extend from 2 ft or 3 ft below the bottom of the screen to 6 ft to 8 ft above the top of the screen. Above this elevation, the space between the well riser and hole or casing shall be filled with either filter sand or any locally available clean fine

sand.

### 3.7 ASSEMBLY AND INSTALLATION OF WELLS

#### 3.7.1 Assembly of Screen and Riser Pipe.

The joints between the screen and riser pipe shall be solvent welded. The screen and riser shall be centered in the well hole or casing and held securely in place during placement of the filter by means of centering devices. Prior to the installation of any screen and riser, the Contractor shall submit to the Contracting Officer for approval, full details of the method, equipment, and devices he proposes to use for centering and holding the screen and riser pipe in the well hole or casing. One centering device shall be provided at the bottom of the screen, with a minimum of one additional centering device for each 20 ft of screen or riser.

#### 3.7.2 Installation

The assembled screen and riser pipe shall be placed in the well hole to avoid jarring impacts and to ensure that the assembly is not damaged or misaligned during installation.

#### 3.7.3 Alignment

Each completed well shall be sufficiently straight and plumb that a cylinder 10 ft long and 2 in. smaller in diameter than the inside diameter of the well can be lowered the full depth of the well and withdrawn without binding against the sides of the screen or riser pipe. A variation of 6 in. per 50-ft depth of well will be permitted in the alignment of the combined screen and riser pipe from a plumb line at the top of the well; however, this will not relieve the Contractor of his responsibility for maintaining adequate clearance for surging and pumping the well.

#### 3.7.4 Placement of Sand Filter

After the screen and riser pipe for the cell, arc, binwall, and 360 nose pier wells have been installed, the specified filter sand shall be pumped or tremied around the well screen up to at least 6 ft above the top of the screens. Above this elevation, the space around the riser pipe may be filled with filter material or locally available sand.

#### 3.7.5 Development of Wells.

Within 4 hrs after installation, the water control wells shall be pumped for not less than 30 minutes. If Revert was added to the drilling fluid, Johnson's Fast Break or equal shall be added to the well in accordance with the manufacturer's recommendations to break down the Revert prior to surging. Development of the well shall be started within 12 hrs after the well has been pumped. Development shall consist of surging the well, while simultaneously pumping with a submersible pump or by air lifting, with a surge block raised and lowered through the well screen at a speed of about 2 ft per sec. The gaskets on the surge block shall be slightly flexible and have a diameter between 0.50 and 0.75 in. smaller than the inside diameter of the well screen. The amount of material deposited in the bottom

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

of the well shall be determined after each cycle. Each cycle shall consist of 15 trips. Surging and air lifting shall continue for a minimum of 30 minutes or until the amount of material deposited in the bottom of the well in one cycle becomes less than 0.2 ft. The well screen shall be pumped clean if the accumulation of material in the bottom of the well becomes more than 1 foot anytime during surging. The well shall also be cleaned of any material in the well after surging and air lifting are completed. Material pumped from the well shall be visually inspected to see if any cell fill material is being removed. After surging is completed, the well shall be pumped until the discharge is clear and contains less than 5 ppm sand. Such pumping shall begin within 1 hour after surging and shall continue for not less than 1 hour. The well shall be pumped at a constant rate equal to the design capacity of the pump for that system; if that flow rate causes a drawdown more than 10 ft, the pumping rate shall be reduced so as not to produce a drawdown more than 10 ft. The suction pipe or hose from the pump shall extend to the bottom of the well. If a submersible pump is used to test the well, the bottom of the pump shall be set about one (1) ft above the bottom of the well. If, when pumping is completed, the well is producing sand at a rate greater than 5 ppm, the well shall be resurged and pumped again. Alternate surging and pumping shall be continued until material entering the well during either surging or pumping is less than the amount specified above, but not for more than 6 hrs. Wells that continue to produce an excessive amount of sand or filter material after 6 hrs of pumping shall be abandoned if directed by the Contracting Officer except that, if he so elects, the Contractor may continue to develop the well by an approved method. If, after such further development, a well meets the above stated requirements, it shall be completed, and after successful completion of the required pumping tests, it will be accepted as satisfactory. After completion of all surging and pumping, any material in the bottom of the well shall be removed by pumping from a suction hose or pipe that extends to the bottom of the well. Water pumped from wells during well development shall not be discharged to surface water, i.e. Ohio River, due to anticipated high turbidity levels. Water pumped from wells during development shall be discharged to the ground surface. The Contractor shall record pertinent data regarding the installation of the well.

#### 3.7.6 Disinfection of Drill Hole and Filter Sand.

During the drilling operation, 2 lbs. of 70-percent calcium hypochlorite shall be added to the drilling fluid at the beginning of drilling and every 4 hrs thereafter if the reverse-rotary or bucket auger method is used. If Revert is used, calcium hypochlorite shall be added when displacement of the fresh drill fluid is completed. As the filter sand is placed in the well, 70-percent calcium hypochlorite shall be added to evenly distribute a minimum of 2 lbs. per ton of filter placed. Upon completion of a well, a minimum of 5 lbs. of granular 70-percent calcium hypochlorite shall be dropped in the well, and mixed by surging the full length of the screen for 10 trips.

#### 3.8 PUMPING TEST ON EACH WELL.

Upon completion of installation, surging, development pumping, and before final acceptance, each well shall be subjected to a pumping test. Before

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

the start of a pumping test, and again after completion, the depth of the well shall be accurately measured by the Contractor in the presence of a Government representative. The well shall be pumped with a submersible pump set about one (1) foot above the bottom of the well. The pump shall have a capacity equal to or greater than the minimum specific capacity. The Contractor shall provide an approved means for accurately measuring both the flow from the well and the water level in the well. The Contractor shall provide and install the necessary discharge pipe and throttle valve so that the flow from the well can be pumped at a constant rate and discharged into the Ohio River as approved by the Contracting Officer. The pumping and sand infiltration tests shall be conducted by the Contractor in the presence of a Government representative. The Contractor shall record and furnish pumping test records in accordance with Section 1.6 SUBMITTALS. The Contractor shall test each well by pumping continuously for a minimum of 1 hour. Pumping shall be at a constant rate equal to the design capacity of the pumps for that water control system but not greater than the rate that will cause a drawdown in the well of more than 10 ft. No test pumping of a well shall be conducted concurrently with surging or pumping of any other well within 100 ft. If sand or other materials infiltrate the well during the pumping test, the following procedures shall be followed:

#### 3.8.1 Resurging Test Pump.

If the rate of infiltration of sand during the last 30 minutes of the pumping test is more than 5 ppm, the well shall be resurged by manipulation of the test pump for 15 minutes. The test pumping shall then be resumed and continued at the rate specified above until the sand infiltration is reduced to less than 5 ppm. If, after such additional test pumping and other remedial measures, the sand infiltration in the well is reduced to less than 5 ppm, the well will be accepted.

#### 3.8.2 Abandoning Well.

If after 4 hrs of pumping, the infiltration of sand is more than 5 ppm, the well shall be abandoned unless the Contractor elects to continue to test pump and perform other approved remedial work approved by the Contracting Officer. All wells and piezometers shall be grouted to the top of the screen prior to demolition of the cofferdam.

#### 3.8.3 Sand Removal Upon Test Completion.

Upon completion of the pumping test, any sand or filter material in the bottom of the well shall be removed by pumping or other approved procedure.

#### 3.9 PUMPING AND WATER LEVEL CONTROL

The wells shall be pumped continuously at the maximum rate commensurate with the rate of inflow to the wells so that the pumping rate does not exceed the (limiting) rate of flow into the wells for the design pump setting. This shall be accomplished by:

Installing a water level controller that will control an electronic actuator capable of operating a valve in the pump discharge line so as

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

to maintain a specified or approved water level within the water control well within +/- 1 foot. Alternately, a pump speed controller may be installed which varies pump motor speed to maintain a +/- 1 ft water level. Water level controllers or pump speed controllers shall not be influenced by temperature, mechanical wear, or moisture [see Para 2.3]. Installing a clear section of plastic pipe in the discharge pipe between the top of the well and the header pipe or (open) discharge point for observing whether or not the pump is pumping water with any air entrainment;  
Installing a throttling valve in the discharge line at the top of the well for valving the flow to minimize variation in the flow of water through the valve controller; and  
Providing a sounding tube in the well to determine the water level in the well. The bottom of the tube shall be set at or below the bottom of the pump.

## 3.10 WATER CONTROL ELECTRICAL SYSTEM

Three-phase power is available at the site. It is the Contractor's responsibility to arrange for electrical service and to be sure that the demand can be met. It will also be the Contractor's responsibility to make the necessary arrangements for and to pay for the electrical services furnished. One hundred (100) percent connected diesel engine generator standby capacity, with connected automatic start-up and transfer switching from commercial power to generator power has been provided. The standby generator(s) and electrical controls and switching are of such design and capacity that all of the submersible pumps in the wells in the cofferdam can be brought on line within 10 minutes after loss of commercial power. If replacement generators are required, the generators shall be new and each shall be provided with the accessories recommended by the manufacturer for starting the diesel engine(s) such as trickle chargers, water and oil heating elements, etc. The generators and electrical controls shall be housed in suitable weatherproof sheds or buildings. The generators shall be provided with fuel tanks with sufficient fuel for 50 hours of engine operation. The generators and associated switchings shall be turned over to the government upon completion of the contract. The electrical controls for the submersible pumps shall include automatic restarting of the pumps in the event of any temporary outage. The electrical system for powering the submersible pumps shall also be of such design that any one pump can be safely disconnected and removed without interfering with the operation of any of the other pumps. A weatherproof control and switch box for each pump shall be mounted at El 447 on a 6- by 6-in. treated wood post set in concrete 3 ft deep near each well. This post shall be painted Day-Glow orange and the number of the well stenciled thereon in large black letters.

A red running light shall be installed on either the control box or the post, wired to illuminate when that pump is not operating. All electrical wiring shall be encased in pipe or electrical conduit buried in a marked trench and surrounded with concrete colored orange at least 3 in. thick, or securely strapped to the discharge pipes so that the wires are protected against damage. All electrical wiring shall comply with the temporary wiring requirements of the latest edition of the National Electrical Code published by the National Fire Protection Association. Each control panel shall have supplemental grounding by installing a direct buried bare copper #1/0 AWG wire from the control panel's ground terminal to the top of the

cell's sheet metal piling. Connection at the metal piling shall be by fusion welding process. A minimum size #1/0 AWG ground wire shall be ran from the main electrical service equipment to each control panel. Contractor shall prepare and submit a coordination/short circuit study for the proposed electrical system for review by the government.

### 3.11 MONITORING WATER CONTROL SYSTEMS

Continuous control of water levels and uplift pressure in the work area is essential for the safety of the cofferdam and for proper construction operations and schedule. It is therefore imperative that the water control system prevent and control seepage in the work area at all times from any source, including the Ohio River adjacent to the excavation. The Contractor shall make measurements and submit them to the Contracting Officer as specified herein. The Government reserves the right to install supplemental water level and flow measuring devices and to observe and/or make measurements of contractor-installed monitoring piezometers; however, such installations and observations shall not relieve the Contractor of his responsibility to install the specified minimum devices, and to obtain the minimum observations and analyses of the data to insure his compliance with the specified performance.

#### 3.11.1 Water Levels.

The Contractor shall read and record the water level in all piezometers and in the water control wells as set forth below for information and use in operating the dewatering systems specified. The Contractor shall also record which wells are being pumped when piezometer and water level readings are taken. The Contractor shall furnish copies of all piezometer and water level readings to the Contracting Officer within 24 hrs of being taken. All data shall be reported as specified in Section 13500, "Instrumentation." The readings and measurements should be made in accordance with the following schedule.

Measure the water levels in the piezometers, and wells daily.  
Measure the flow from individual wells and the total flow from the dewatering system, Mon., Wed, and Fri.  
Measure any sand in the flow from all of the water control wells, Wed.  
Read the river stages upstream and downstream of the work area, daily.  
Check each well whether or not the pump is pumping air, daily.

#### 3.11.2 Well Flow.

Flow from individual wells may be measured with an approved flow meter installed in the discharge line from the pump (that reads directly in gpm), or by shutting off flow to discharge or to the discharge header as the case may be, and then opening the diversionary valve and measuring the flow volumetrically with a calibrated container and a stop watch. Any sanding of the well can be similarly checked in this manner. The Contractor under the direction of the Contracting Officer shall make all flow measurements.

#### 3.11.3 Sanding.

The flow from each well shall be checked for sanding. The rate of sanding shall be determined by taking a measured amount of water being pumped from each well and then determining the sand content. The maximum acceptable rate of sanding shall be 5 ppm.

### 3.12 OPERATION AND MAINTENANCE

#### 3.12.1 Supervision

Operation and maintenance of the well systems, any necessary supplemental water control facilities shall be supervised by the Dewatering Superintendent as specified in Section 1.8, QUALIFICATIONS AND DUTIES OF CONTRACTOR. Supervisory personnel shall be present on site during normal working hours and shall be available on call 24 hrs a day, 7 days a week, including all holidays.

#### 3.12.2 Operating Personnel

Sufficient personnel (a minimum of three during the day shift and one on all other shifts) skilled in the operation, maintenance, replacement, and monitoring of water control systems, pumps, equipment, and electrical systems and generators, shall be onsite 24 hrs a day, 7 days a week, including holidays, when the systems are in operation. The system shall be monitored continuously to ensure proper operation. In the event that maintenance is required these personnel shall discontinue all other activities immediately in order to perform the necessary repairs to restore the system to full operating condition.

#### 3.12.3 Repair and Replacement

The pumps and controls shall be maintained in operable condition at all times with no more than two wells or pumps inoperative at any one time. The Contractor shall immediately repair or replace any well or pump that becomes inoperative. Should the efficiency of a well or pump show any significant reduction relative to its initial efficiency, the Contractor, shall clean the pump and redevelop and/or chemically treat the well to restore its efficiency. If the efficiency of the well cannot be restored, a replacement shall be installed. In case of failure of any component of the water control systems, including piezometers, such component shall be repaired or replaced and completed within 8 hrs. The electrical power system to the water control pumps shall be designed, maintained, and operated to be failsafe. The necessary small tools, hoisting equipment, and other equipment required for repairs shall be in good condition and shall be kept at the site full-time while the water control systems are in operation. Replacement equipment and materials shall conform to the requirements of these specifications. The Contractor shall be solely responsible for the cost of all repairs and maintenance of specified and any supplemental wells, piezometers, pumps, diesel generators, and the electrical system. In the event that the cofferdam is flooded, the Contractor shall repair all components of the water control system at no additional cost to the Government. The Contractor shall start all pumps before unwatering begins. Monitor all wells and piezometers during unwatering to evaluate their performance and ability to meet the design

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

requirements. Any problems with the water control system shall be immediately corrected by methods such as rehabilitating the wells or increasing pump capacity. The system shall lower the piezometric levels to those shown in paragraph 3.2.

## 3.12.4 Maintenance

The Contractor shall have a regularly scheduled maintenance program that conforms with the equipment manufacturer's recommendations and includes all other work necessary to maintain all system components fully operational. The maintenance program shall include, checking the flow rate and water elevation in each well, as specified in paragraph MONITORING WATER CONTROL SYSTEMS starting each diesel generator and nonoperating pumps weekly and operating the generators and nonoperating pumps for a minimum of 30 minutes. All pumps, both operating and nonoperating, shall be independently tested monthly for wear. The Contractor shall clean or replace all pumps that do not lower the water level in the well to the elevations given in paragraph SUBMERSIBLE PUMPS AND WIRING. The chemical content of the water may cause a certain amount of clogging of filters, well screens, pump bowls, risers, and discharge pipes, by chemical incrustation and iron bacteria. If such clogging should occur, the Contractor shall take the necessary measures to clean and/or redevelop or replace the wells or equipment if necessary. Any cleaning and/or redevelopment of water control wells shall be subject to approval of the Contracting Officer, but such approval shall not relieve the Contractor of his responsibility to cofferdam achieve the water control levels specified.

The Contractor shall include in his maintenance program the cleaning of all pumps and screens as necessary to ensure the system is operating in accordance with the design. This will require the removal of the pump and visual inspection of the well along with cleaning of pumps, screens, and associated piping as needed. The Contractor shall utilize a commercially available software package to maintain his daily maintenance log and provide a copy to the Resident Engineer as requested. The Contractor shall provide maintenance to the water control system until the cofferdam is rewatered.

## 3.13 GROUNDWATER PROTECTION PLAN

The Contractor is referred to Section 01410 ENVIRONMENT PROTECTION, paragraph 3.6.1, for discussion regarding preparation and implementation of a groundwater protection plan for water well construction, installation, and abandonment activities.

-- End of Section --



SECTION TABLE OF CONTENTS

DIVISION 02 - SITE WORK

SECTION 02210

SUBSURFACE DRILLING, SAMPLING, AND TESTING

10/95

PART 1 GENERAL

- 1.1 REFERENCES
- 1.2 UNIT PRICES
  - 1.2.1 Core Hole Overburden Drilling
    - 1.2.1.1 Measurement.
    - 1.2.1.2 Unit of Measure
  - 1.2.2 Core Drilling, Vertical Holes (PQ)
    - 1.2.2.1 Payment
    - 1.2.2.2 Measurement
    - 1.2.2.3 Unit of Measure
  - 1.2.3 Core Drilling, Vertical Holes (NQ)
    - 1.2.3.1 Payment
    - 1.2.3.2 Measurement
    - 1.2.3.3 Unit of Measure
  - 1.2.4 Augering of Overburden
- 1.3 SYSTEM DESCRIPTION
  - 1.3.1 Core Drilling
- 1.4 SUBMITTALS
- 1.5 CARE AND DELIVERY OF SAMPLES
  - 1.5.1 General
- 1.6 PROJECT/SITE CONDITIONS
  - 1.6.1 Environmental Requirements
  - 1.6.2 Field Measurements
- 1.7 SEQUENCING AND RESPONSABILITY
  - 1.7.1 Order of Work
  - 1.7.2 Responsibility

PART 2 PRODUCTS

- 2.1 CONTAINERS
  - 2.1.1 Core Boxes
- 2.2 CORE BOX LABELS

PART 3 EXECUTION

- 3.1 MOBILIZATION AND DEMOBILIZATION
  - 3.1.1 Mobilization/Demobilization
- 3.2 EQUIPMENT AND SUPPLIES
  - 3.2.1 Core Drilling - PQ Size Core
- 3.3 IDENTIFYING SAMPLES

- 3.4 CORE DRILLING (PQ and NQ)
  - 3.4.1 Procedure
  - 3.4.2 Arrangement of Core
  - 3.4.3 Retention of Core
  - 3.4.4 Labeling, Marking and Packing Core
- 3.5 BACKFILLING
  - 3.5.1 Drill Holes
- 3.6 RECORDS
- 3.7 GROUNDWATER PROTECTION PLAN

-- End of Section Table of Contents --

## SECTION 02210

## SUBSURFACE DRILLING, SAMPLING, AND TESTING

10/95

## PART 1 GENERAL

The work covered by this section consists of furnishing all plant, labor, equipment, and materials and performing all operations required to core drill the bedrock for inspection of foundation as required in Section 02217: Foundation Preparation, Section 02226: Foundation Blasting and Excavation, and 02466: Drilled Foundation Caissons (Piers).

**\*1**

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

## AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 2113	(1983; R 1993) Diamond Core Drilling for Site Investigation
ASTM D 2487	(1993) Classification of Soils for Engineering Purposes (Unified Soil Classification System)
ASTM D 2488	(1993) Description and Identification of Soils (Visual-Manual Procedure)

**\*1**

## 1.2 UNIT PRICES

All measurements for payment shall be made by or in the presence of the Contracting Officer. The Contractor shall preserve all holes in good condition until final measurement and until the records and samples have been examined and accepted. Payment will be made only for drilling those holes as specified herein, or are directed by the Contracting Officer to be so drilled or excavated. Payment will not be made for any hole or testing for which satisfactory records (and samples), as determined by the Contracting Officer, are not furnished.

## 1.2.1 Core Hole Overburden Drilling

Payment will be made for costs associated with Core Hole Overburden Drilling. If required, any core hole drilling through non-earthen overburden, in order to permit core drilling of rock for holes, shall be paid under "Core Hole Overburden Drilling" on the bid schedule.

## 1.2.1.1 Measurement.

Core Drilling Overburden Drilling will be measured for payment to the nearest foot, based upon the linear feet of hole actually drilled in overburden in accordance with the specifications.

## 1.2.1.2 Unit of Measure

Unit of Measure: linear foot

## 1.2.2 Core Drilling, Vertical Holes (PQ)

## 1.2.2.1 Payment

Payment will be made for costs associated with Core Drilling Vertical Holes for PQ size Diamond Core Drilling Manufacturer's Association Cores.

## 1.2.2.2 Measurement

Core Drilling Vertical Holes for PQ size cores will be measured for payment to the nearest foot, based upon the linear feet of hole actually drilled in rock in accordance with the specifications.

## 1.2.2.3 Unit of Measure

Unit of measure: linear foot.

## 1.2.3 Core Drilling, Vertical Holes (NQ)

## 1.2.3.1 Payment

Payment will be made for costs associated with Core Drilling Vertical Holes for NQ size Diamond Core Drilling Manufacturer's Association Cores.

## 1.2.3.2 Measurement

Core Drilling Vertical Holes for NQ size core will be measured for payment to the nearest foot, based upon the linear feet of hole actually drilled in rock in accordance with the specifications.

## 1.2.3.3 Unit of Measure

Unit of measure: linear foot.

## 1.2.4 Augering of Overburden

When required, auger drilling of earthen overburden shall be incidental to work conducted under "Core Drilling, Vertical Holes (NQ)" on the bid schedule.

## 1.3 SYSTEM DESCRIPTION

The purpose of the work specified herein is to determine the type, nature,

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

and characteristics of subsurface materials and the extent and conditions of the various materials as they exist to the depths and at the locations specified. This is to be accomplished by means of core drilling.

## 1.3.1 Core Drilling

Drilling of cores shall be by any approved standard and accepted method of rotary rock core drilling that will provide continuous and complete rock cores of the required diameter from any subsurface interval of bedrock specified for investigation. Methods shall comply with the following; ASTM D 2113; ASTM D 2487; and ASTM D 2488. The method used shall provide equally good recovery of cores from both hard and soft rocks. Cores within the monoliths shall be a minimum of PQ size. Cores within the access bridge piers shall be NQ sized cores. It will be to the discretion of the Contractor to drill the NQ core borings before or after the bridge piers have been excavated. In cases where the monoliths contain a bridge pier, the NQ core will not be needed and the PQ core will be drilled as normal.

## 1.4 SUBMITTALS

Government approval is required for all submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01335 SUBMITTAL PROCEDURES:

SD-01 Data

Permits, Certifications, and Licenses; FIO.

The Contractor shall comply with all Federal, State and local laws, regulations and ordinances relating to the performance of this work. The Contractor shall, at his own expense, procure all required permits, certifications and licenses required of him by Federal, State, and local law for the execution of this work. Copies of all such documents shall be furnished to the Contracting Officer prior to starting work.

Qualifications; GA, ED.

The Contractor shall supply prior experience of all drill rig operators and geologists who will be responsible for the drilling operations and logging of rock core. Copies of all such documents shall be furnished to the Contracting Officer prior to starting work.

SD-08 Statements

Drilling, Sampling, and Testing Plan; GA, ED.

Prior to starting work, the Contractor shall submit a plan for drilling, sampling, testing, and safety. The plan shall include, but not be limited to, the proposed method of drilling and sampling including a description of the equipment and sampling tools that will be used, a listing of any subcontractors to include a description of how the subcontractors will be used and a description of all methods and procedures that will be utilized to insure a safe operation and to protect the environment. This submittal

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

shall also include a statement of the prior experience, in the type of work described in these specifications, of the person or persons designated to perform the work specified herein. No work shall be performed until this plan has been approved and no deviation from the approved plan will be permitted without prior approval by the Contracting Officer.

## SD-18 Records

Drilling Log; GA, ED.

The Contractor shall submit complete and legible copies of DRILLING LOG, LRL form 1202 and records to the Contracting Officer within 24 hours after a hole is completed.

Drilling Layout; GA, ED.

The Contractor shall submit complete, legible copies of the Drilling Layout, depicting the location of the completed borings within each monolith or access bridge pier.

## 1.5 CARE AND DELIVERY OF SAMPLES

## 1.5.1 General

The Contractor shall be solely responsible for preserving all cores in good condition. Samples shall be kept from freezing and from undue exposure to the weather, and shall keep all descriptive labels and designations on and boxes clean and legible until final delivery of samples to, and acceptance by, the Contracting Officer. Except as otherwise specified, the Contractor shall deliver samples to the Contracting Officer upon completion of the contract.

## 1.6 PROJECT/SITE CONDITIONS

## 1.6.1 Environmental Requirements

The Contractor shall comply with Section 01410 ENVIRONMENT PROTECTION.

In order to prevent and to provide for abatement and control of any environmental pollution arising from Contractor activities in the performance of this contract, the Contractor and his subcontractors shall comply with all applicable Federal, State, and local laws, regulations, and ordinances concerning environmental pollution control and abatement.

a. The Contractor shall be responsible for keeping informed of all updates and changes in all applicable laws, regulations, and ordinances.

b. The Contractor shall not pollute lakes, ditches, rivers, springs, canals, waterways, groundwaters, or reservoirs with drill fluids, fuels, oils, bitumens, calcium chloride, insecticides, herbicides, or other materials that may be harmful to the environment or a detriment to outdoor recreation.

\*1

## 1.6.2 Field Measurements

Two (2) PQ size core holes shall be drilled in the bedrock underlying each monolith to a minimum depth of 20 feet below the proposed foundation elevation of each monolith. Each pair of rock cores shall be located in opposite diagonal corners of the monoliths, 10' toward the middle of the monolith from those corners. A total of six (6) PQ size core holes shall be drilled in each of the Miter Gate Sills, logically distributed throughout the monolith footprint. A total of four (4) borings shall be made in each of the Miter Gate Bay monoliths, logically distributed throughout the monolith footprint. **A total of three (3) borings shall be made in each of the Bulkhead Sills.** Additional core holes shall be drilled at the discretion and direction of the Contracting Officer in order to fully characterize the structure's foundation. One (1) NQ size core hole shall be drilled in the location of each access bridge pier to a minimum depth of ten feet below the proposed tip elevation of the deepest founded drilled shaft in the pier.

\*1

## 1.7 SEQUENCING AND RESPONSABILITY

\*1

## 1.7.1 Order of Work

**Core drilling in each monolith foundation footprint shall precede all work in that monolith by 45 days, including blasting, excavation, preparation, and any concrete or RCC placement.** Core drilling for bridge piers can be conducted before or after the drilling of rock sockets for any piers.

\*1

## 1.7.2 Responsibility

a. The Contractor shall provide a qualified, licensed Geologist experienced in subsurface exploration for each drill rig to oversee all drilling operations. The geologists shall be on-site with the drilling equipment at all times when drilling is being performed. These geologists shall be responsible for the preparation of a separate log and/or report for each boring. This individual shall also be responsible for the preparation of rock cores.

b. The presence of a Government representative or the keeping of separate drilling records by the Contracting Officer shall not relieve the Contractor of the responsibility for the work specified in this specification.

## PART 2 PRODUCTS

## 2.1 CONTAINERS

The Contractor shall furnish boxes that meet the following requirements. All such containers will become the property of the Government and the cost thereof shall be included in the contract price for the applicable item for which payment is provided.

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

## 2.1.1 Core Boxes

Longitudinally partitioned, hinged top, wooden core boxes constructed of plywood and dressed lumber or other approved materials in general accordance with the arrangement and dimensions shown in FIGURE 1 shall be used for all rock cores. As many core boxes as may be required shall be used to box all core. Core boxes shall be completely equipped with all necessary partitions, hinges, and a hasp for holding down the cover. In addition, the Contractor shall provide wood spacers made of surfaced lumber (not plywood) and having dimensions that are 1/8 inch less than the inside dimensions of the individual core box troughs and no less than 3/4 inch thick for blocking the core in the boxes and for providing a marking space to identify core runs and pull depths/elevations. The quantities of these blocks that are required are: five blocks per core box for NQ, and three blocks per core box for PQ core. The box should have the following capacities:

PQ core	2 rows of core
NQ core	4 rows of core

The maximum length of a core box for core that is larger than PQ size shall be 5 feet. Spacers shall be placed in the proper position in core boxes to show voids and losses.

## 2.2 CORE BOX LABELS

Core boxes shall be identified on the top and on both ends with stenciled labels. The information on these labels shall contain the following:

PROJECT: McAlpine Lock Replacement Project

DATE: \_\_\_\_\_

HOLE NO. DC-\_\_\_\_\_

Monolith/Pier # \_\_\_\_\_

BOX NO. \_\_\_\_\_ of \_\_\_\_\_

## PART 3 EXECUTION

## 3.1 MOBILIZATION AND DEMOBILIZATION

## 3.1.1 Mobilization/Demobilization

Mobilization shall consist of the delivery to the site of all plant, equipment, materials and supplies to be furnished by the Contractor, the complete assembly in satisfactory working order of all such plant and equipment at the jobsite and the satisfactory storage at the site of all such materials and supplies. Demobilization shall consist of the removal from the site of all plant, equipment, materials and supplies after completion of the work and also includes, at the direction of the Contracting Officer, the cleanup and removal of all scrap, waste backfill material, waste drilling fluid, soil contaminated with engine/hydraulic



## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

oil, backfilling all sumps or excavations resulting from the operations and, in general, returning the site as close to its original condition as possible. All disposal of waste materials shall conform to the criteria in Section 01410: Environmental Protection.

### 3.2 EQUIPMENT AND SUPPLIES

#### 3.2.1 Core Drilling - PQ Size Core

Equipment to be furnished by the Contractor for core drilling shall include hydraulic fed, core-drilling machinery of a type or types approved by the Contracting Officer complete with all the accessories needed to take continuous rock cores of a diameter consistent with bit size to the depths specified. The Contractor shall use, as a minimum, a standard ball-bearing, swivel-head, double-tube with split inner tube core barrel, or equivalent. The capacity of the core barrel shall not exceed 10.5 feet of core. Supplies for core drilling to be furnished by the Contractor shall include, but not be limited to, all casing, drill rods, core barrels, coring bits, piping, pumps, water, tools, and power required for drilling and all boxes and containers required for core samples. Selection of the type of bit shall be at the Contractor's discretion provided that the selected bit produces high quality rock core. The Contractor's drilling equipment shall be capable of drilling vertical core holes as specified.

### 3.3 IDENTIFYING SAMPLES

Labels shall comply with Part 2 CORE BOX paragraph LABELS

### 3.4 CORE DRILLING (PQ and NQ)

#### 3.4.1 Procedure

All holes shall be drilled vertically at the locations and to the bottom elevations or depths specified herein. Off-setting of borings from the locations specified will not be permitted without prior approval. Casing to the top of rock may be required in the borings at the access bridge pier locations. In some locations, the overburden may be backfill debris containing rubble and concrete boulders. This type of overburden may require drilling and advancement of casing with the drilling. All casing shall be sealed in the rock at the elevation where rock is encountered prior to commencement of rock coring. The Contractor shall operate his drills at such speeds and with such down pressures and shall control drill fluid pressures and quantities to insure maximum core quality and recovery in whatever kind of rock is encountered. Where soft or broken rock is encountered, the Contractor shall reduce the length of runs to 5 feet or less in order to reduce and/or keep core loss and core disturbance to the minimum. Failure to comply with the foregoing procedures shall constitute justification for the Contracting Officer to require re-drilling, at the Contractor's expense, of any boring from which the core recovery is unsatisfactory. The Contractor shall exercise particular care in recording zones of water loss, cavities, rod jerks, rough drilling and other unusual and non-ordinary coring experiences that, supplementing the core record, will throw light on the nature and the extent of any fracturing or abnormalities.

### 3.4.2 Arrangement of Core

Core boxes shall comply with PART 2, paragraph CORE BOXES. All cores shall be arranged neatly in the partitioned boxes in the same sequence in which they occurred before removal from the hole. Facing the open box with the hinged cover above and the open box below, cores shall be arranged in descending sequence beginning at the left end of the trough nearest the hinges and continuing in the other troughs from left to right. Spacer blocks shall be included in runs where voids or losses occurred equivalent to the amount of loss as described in Section 2. The highest part of the core shall be placed in box 1, and the lower portions of the core shall be placed in the other boxes in consecutive order. Core from no more than one hole shall be placed in any given box.

\*1

### 3.4.3 Retention of Core

The Contractor shall make the core obtained from each cored hole available to the Contracting Officer for examination when the core is pulled from the hole. The contractor shall be responsible for providing any labor necessary for retrieval, laydown, display, arrangement, pickup, and storage of core boxes for the Contracting Officer's examination. Holes will not be accepted until rock cores have been examined by the Contracting Officer.

**The core shall be available for inspection within 24 hours after being obtained.** All cores shall be retained, boxed, and maintained by the Contractor for the duration of the Contract. The Contractor shall protect the retained core from freezing and undue exposure to the weather. Preservation of retained core in good condition and delivery of the retained cores to the Government facility, located at the Indiana Army Ammunition Plant, Clarksville, Indiana, shall be the responsibility of the contractor. The Contractor shall deliver the core to the Government facility, after the monolith the core are obtained from is approved for concrete placement.

\*1

### 3.4.4 Labeling, Marking and Packing Core

Stenciled labels for core boxes complying with paragraph CORE BOX LABELS shall be placed on the inside and outside of the top cover in addition to each end. In addition, the depths (or elevations) of each core run/pull shall be marked with a black waterproof pen on the spacer blocks that are placed between core pulls. When needed, loss blocks shall be used to mark locations of core loss. When a box is full, the space between the core and the trough sides shall be filled with finely ground vermiculite or other packing material approved by the Contracting Officer.

## 3.5 BACKFILLING

### 3.5.1 Drill Holes

Unless otherwise directed by the Contracting Officer, all drill holes shall be backfilled with grout. The Contractor shall preserve all holes in good condition until final measurement and until the records and samples have

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

been accepted. All holes shall be grouted from the bottom of the hole to the top of the hole using a grout mixture of five gallons of water per sack (94 pounds) of Portland cement. A water reducing admixture may be used to produce a grout consistency required for the placement method. All grout shall be pumped through a tremie pipe that is inserted to the bottom of the boring to insure that the grout fills the full extent of the hole. All backfilling operations shall be performed in the presence of the Contracting Officer. No separate payment will be made for backfilling drill holes. The cost of this work shall be included in the drilling costs.

## 3.6 RECORDS

The Contractor shall keep accurate driller's logs (DRILLING LOG, ORL form 1202 will be provided by the Contracting Officer) and records of all work accomplished under this contract and shall deliver complete, legible copies of these logs and records to the Contracting Officer within 24 hours after a hole is completed. All such records shall be recorded during the actual performance of the work and shall be preserved in good condition and order by the Contractor until they are delivered and accepted. The Contracting Officer shall have the right to examine and review all such records at any time prior to their delivery to him and shall have the right to request changes to the record keeping procedure. The following information shall be included on the logs or in the records for each hole:

- a. Hole number or designation and elevation of top of hole.
- b. Driller's name and Geologist's name.
- c. Make, size, and manufacturer's model designation of drilling, equipment.
- d. Type of drilling operation by depth.
- e. Hole diameter.
- f. Dates and time by depths when drilling operations were performed.
- g. Time required for drilling each run.
- h. Drill action, rotation speed, hydraulic pressure, water pressure, tool drops, and any other unusual and non-ordinary experience which could indicate the subsurface conditions encountered.
- i. Depths at which samples or cores were recovered or attempts made to sample or core including top and bottom depth of each run.
- j. Classification or description by depths of the materials cored using the Unified Soil Classification System (ASTM D 2487) and including a description of moisture conditions, consistency and other appropriate descriptive information as described in ASTM D 2488. This classification or description shall be made immediately after the samples or cores are retrieved.
- k. Classification and description by depths of rock materials cored

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

including rock type, composition, texture, presence and orientation of bedding, foliation, or fractures, presence of vugs or other interstices, and the RQD for each cored interval.

- n. Percentage of sample or core recovered per run.
- p. Depths at which drill water is lost and regained and amounts.
- q. Depths at which the color of the drill water return changes.
- r. Type and weight of drill fluid.
- s. Depth of bottom of hole.

**\*1**

**3.7 GROUNDWATER PROTECTION PLAN**

The Contractor is referred to Section 01410 ENVIRONMENT PROTECTION, paragraph 3.6.1, for discussion regarding preparation and implementation of a groundwater protection plan for installation, construction, and abandonment of wells, bore holes, and core holes. **\*1**

-- End of Section --

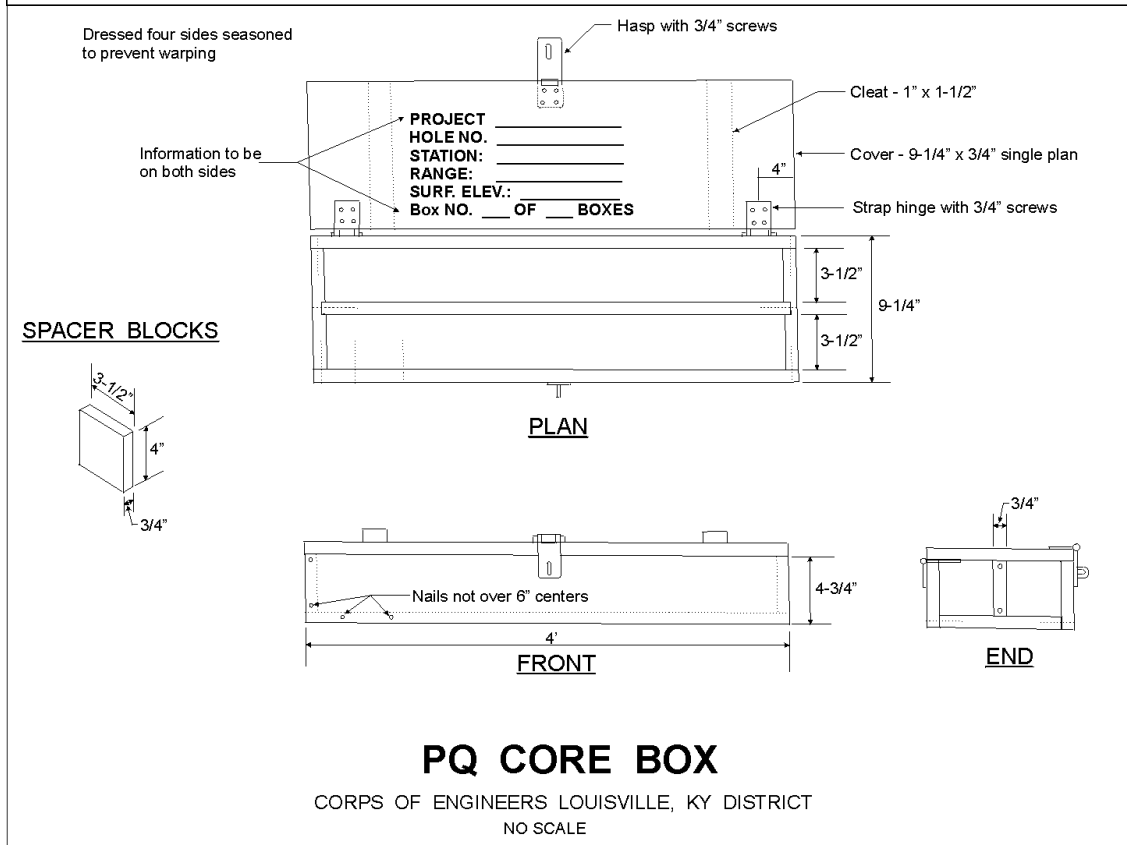
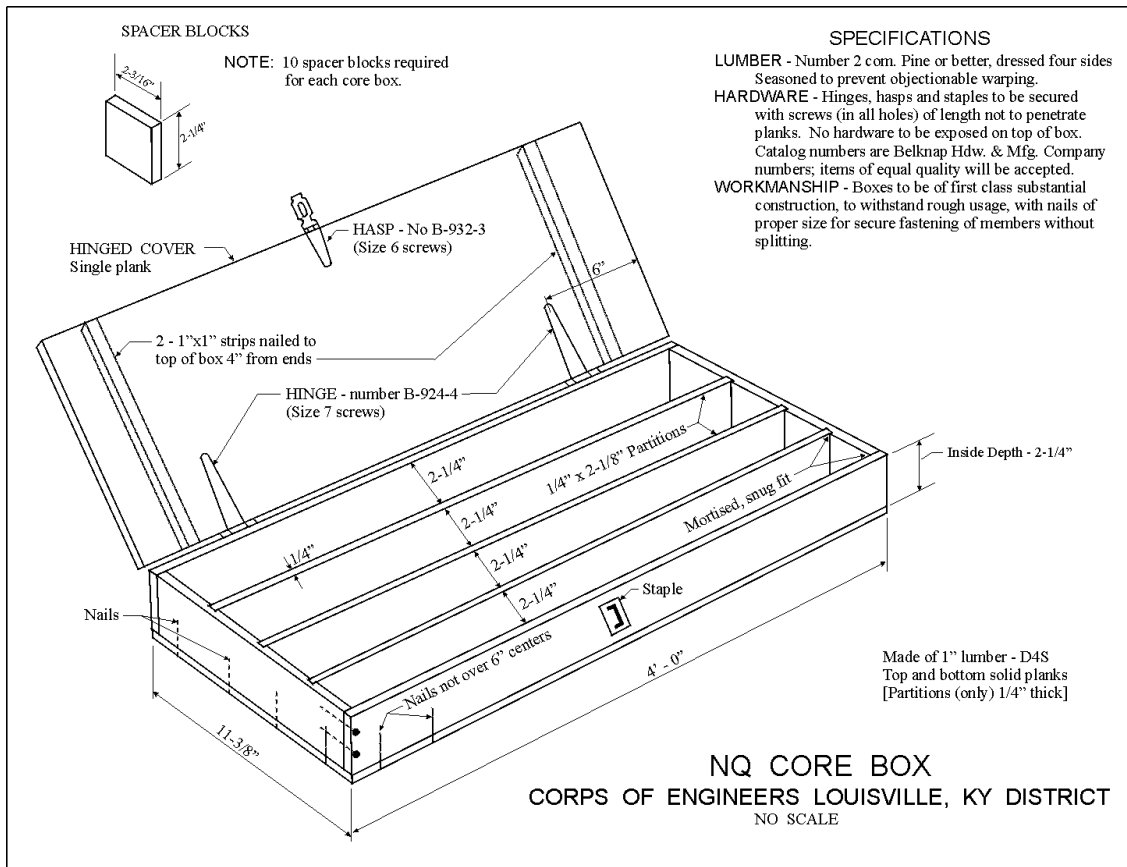


FIGURE 1

BORING NO.

SHEET 1 OF

1. PROJECT		11. DATUM FOR ELEVATION SHOWN (TBM OR MSL)
2. LOCATION        N                        E		
3. DRILLING AGENCY		12. DRILL METHOD
4. NAME OF DRILLER		13. ELEVATION TOP OF HOLE
5. DRILL TYPE		14. TOTAL NUMBER CORE BOXES
6. THICKNESS OF OVERBURDEN		15. ELEVATION GROUND WATER
7. DEPTH DRILLED INTO ROCK		16. DATE HOLE STARTED                                        COMPLETED
8. TOTAL DEPTH OF HOLE		
9. DIRECTION OF HOLE VERTICAL <input checked="" type="checkbox"/> INCLINED <input type="checkbox"/> _____ DEG. FROM VERT		17. INSPECTOR

ELEVATION	CLASSIFICATION OF MATERIALS	LEGEND	USCS CLASS	SAMPLE #	SAMPLE TYPE	BLOWS PER 6-INCH	MOISTURE (%)	PENETRATION	RECOVERY (%)	ROD (%)	REMARKS	DEPTH SCALE (FT)
0												0
												1
												2
												3
												4
												5
												6
												7
												8
												9
												10
												11
												12
												13
												14
												15
												16
												17
												18
												19
												20

BORING LOG (Cont Sheet)		ELEVATION TOP OF HOLE				Hole No.						
1. PROJECT						SHEET 2 OF SHEETS						
ELEVATION	CLASSIFICATION OF MATERIALS	LEGEND	USCS CLASS	SAMPLE #	SAMPLE TYPE	BLOWS PER 6-INCH	MOISTURE (%)	PENETRATION	RECOVERY (%)	ROD (%)	REMARKS	DEPTH SCALE (FT)
												20
												21
												22
												23
												24
												25
												26
												27
												28
												29
												30
												31
												32
												33
												34
												35
												36
												37
												38
												39
												40
LRL FORM 1202 JUNE 2000		PREVIOUS EDITIONS ARE OBSOLETE. SYMBOLS: v - WATER LEVEL AT COMPLETION				PROJECT					HOLE NO.	
												> - PARTIAL LOSS OF DRILL FLUID

SECTION TABLE OF CONTENTS

DIVISION 02 - SITE WORK

SECTION 02217

FOUNDATION PREPARATION

**12/92**

PART 1 GENERAL

1.1 UNIT PRICES

1.1.1 Preliminary Cleanup

1.1.1.1 Payment

1.1.1.2 Measurement

1.1.1.3 Unit of Measure

1.1.2 Final Cleanup and Foundation Preparation

1.1.2.1 Payment

1.1.2.2 Measurement

1.1.2.3 Unit of measure

1.1.3 Dental Concrete/Mortar

1.1.3.1 Unit of Measure

1.1.4 Protective Coating

1.1.4.1 Unit of Measure

1.2 DEFINITIONS

1.2.1 Foundations

1.2.2 Jointed/Fractured Rock

1.3 SUBMITTALS

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Dental Concrete

2.1.2 Dental Mortar

PART 3 EXECUTION

3.1 EXAMINATION

3.2 PREPARATION

3.2.1 Equipment

3.2.1.1 Tools

3.2.1.2 Air/Water Jet

3.2.1.3 Water Jet

3.3 PRELIMINARY CLEANUP

3.4 FINAL CLEANUP AND FOUNDATION PREPARATION

3.5 DENTAL TREATMENT

3.5.1 Dental Concrete

3.5.2 Dental Mortar

3.6 Protective Coating.

3.7 FOUNDATION INSPECTION AND GEOLOGIC MAPPING



AMENDMENT #0001

\*\*\*SAFETY PAYS\*\*\*

McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

-- End of Section Table of Contents --

## SECTION 02217

## FOUNDATION PREPARATION

**12/92**

## PART 1 GENERAL

## 1.1 UNIT PRICES

## 1.1.1 Preliminary Cleanup

## 1.1.1.1 Payment

Payment will be made for costs for each preliminary cleanup satisfactorily performed at the direction of the Contracting Officer. Payment will be made for each cleanup of the same area if more than one cleanup has been directed and satisfactorily performed.

## 1.1.1.2 Measurement

Preliminary cleanup will be measured for payment by determining the area cleaned to the nearest square yard.

## 1.1.1.3 Unit of Measure

Unit of measure: square yard.

## 1.1.2 Final Cleanup and Foundation Preparation

## 1.1.2.1 Payment

Payment will be made for costs associated with final cleanup and preparation of the area for each type of foundation preparation that has been satisfactorily prepared. Where preliminary cleanup has been directed and performed, and the contractor subsequently performs final cleanup and foundation preparation, payment will be made for preliminary cleanup. Payment will not be made for any cleanup subsequent to a final cleanup and foundation preparation, which has previously been approved.

## 1.1.2.2 Measurement

Final cleanup and foundation preparation will be measured for payment by determining the area cleaned and prepared to the nearest square yard.

## 1.1.2.3 Unit of measure

Unit of Measure: Square yard.

## 1.1.3 Dental Concrete/Mortar

All payment for materials associated with dental concrete/mortar shall be made as specified in Section 03300: GENERAL CONCRETE REQUIREMENTS. All

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

payment for labor involved with the placement of the dental concrete/mortar, shall be paid by the cubic-yard of dental concrete/mortar placed.

## 1.1.3.1 Unit of Measure

Dental Concrete/Mortar shall be measured for payment by the Cubic-Yard.

## 1.1.4 Protective Coating

All payment for protective coating will be measured for payment as referenced in the Bid Schedule "Protective Coating". Payment will be measured per nearest gallon.

## 1.1.4.1 Unit of Measure

Unit of Measure: Gallon

## 1.2 DEFINITIONS

## 1.2.1 Foundations

The rock foundation is comprised of the rock surfaces upon which concrete structures are placed. Vertical surfaces, where permitted or required by these specifications, are included.

## 1.2.2 Jointed/Fractured Rock

Rock joints and fractures are all planar and/or curvilinear fractures, including cracks, crevices, and seams which separate a rock mass into individual rock blocks and pieces of various sizes. They may be open or tight and may be filled with material other than rock material. These fractures include both natural and blast fractures induced during historical blasting at the project site, which can be expected.

## 1.3 SUBMITTALS

Government approval is required for all submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01335 SUBMITTAL PROCEDURES:

SD-07 Schedules

Tools; FIO.

Tabular list of light power tools to be used in lieu of hand tools shall be submitted prior to their use on the job site.

## PART 2 PRODUCTS

## 2.1 MATERIALS

## 2.1.1 Dental Concrete

Materials for dental concrete shall conform to the requirements of Section 03300: GENERAL CONCRETE REQUIREMENTS.

#### 2.1.2 Dental Mortar

Materials for dental mortar shall conform to the requirements of Section 03300: GENERAL CONCRETE REQUIREMENTS.

### PART 3 EXECUTION

#### \*1

#### 3.1 EXAMINATION

The limits of the proposed foundations for the various parts of the work are approximately as indicated. The Contracting Officer reserves the right to change the depth to, or the width of, the foundations if, conditions exposed in the foundation excavations, or as determined by exploratory drilling, warrant such modifications. **All coring shall be conducted in such manor and time frame as specified in SECTION 02210: Subsurface Drilling and Sampling.**

\*1

#### 3.2 PREPARATION

##### 3.2.1 Equipment

##### 3.2.1.1 Tools

Hand tools, where required or permitted by these specifications include, but are not limited to shovels, bars, picks, wedges, and brooms. Light power tools may be used in lieu of hand tools only when such use is approved.

##### 3.2.1.2 Air/Water Jet

An air/water jet shall consist of a 1-1/2 inch nozzle with associated controls and supply hoses connected to suitable sources of compressed air and water. Compressed air shall have a pressure between 90 and 110 psi. Water shall be introduced into the airstream at the nozzle when needed, at a rate of up to 30 gpm. The air and water shall be separately controllable at the nozzle.

##### 3.2.1.3 Water Jet

A water jet shall consist of a 1 inch nozzle with a supply hose connected to a suitable source of water. The system shall be capable of delivering up to 200 gpm. The flow rate shall be controllable at the nozzle.

#### 3.3 PRELIMINARY CLEANUP

When the excavation has reached the approximate limits shown or when the Contracting Officer determines that a satisfactory foundation may have been reached, the Contracting Officer may direct that a preliminary cleanup be

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

performed on all or any part of the rock foundation surface. This cleanup shall consist of removing all debris, sand, silt, loose rock, freshly blast fractured rock, historically blast fractured rock, and other objectionable material by hand tools followed by water or air/water jets or any combination of additional methods approved or directed. The Contracting Officer may require that the excavation be continued and the preliminary cleanup procedure repeated until a satisfactory foundation surface is reached.

### 3.4 FINAL CLEANUP AND FOUNDATION PREPARATION

Unless otherwise directed, Final Cleanup and Foundation Preparation shall be performed on all foundation bedrock. This work shall consist of removing any remaining loose and/or fractured rock and pockets of fines, sand, rock rubble or gravel and other objectionable material from the in place rock surface including areas of depression, large crevices, and open rock joints. Mechanical equipment may be used but such equipment will be rubber tired only. Jack-hammering, picking, barring, and hand excavation may be necessary to obtain a foundation surface free from loose, drummy, blast damaged, or shattered materials. Irregularities in the rock surfaces shall be trimmed to form a reasonable uniform slope on the abutments. Overhangs shall not be permitted at any location. The final rock surface shall be thoroughly cleaned by use of water jets and/or air/water jets or other approved method and shall be maintained in a clean condition until the placement of concrete thereon.

### 3.5 DENTAL TREATMENT

Dental treatment shall consist of excavation, if necessary, of the material in joints, cavities, depressions, and overhangs and the placement of concrete such that the final surface is satisfactory for the subsequent placement of concrete. Unless otherwise directed, Dental Treatment shall be performed on all joints 1 inch or greater in width. Joints and cavities shall be excavated to a depth 3 times the width (measured at the base of the excavation) of the joint or cavity.

#### 3.5.1 Dental Concrete

Concrete shall be used to fill joints, cavities, depressions, and overhangs except where the use of mortar is required or permitted. Dental concrete shall be placed when the width of the opening is greater than three inches.

Prior to placement, the surfaces of the joint, cavity, depression, or overhang will be thoroughly cleaned using air/water or water jets. The maximum aggregate size shall be as directed. The concrete and placement techniques shall conform with SECTION 3301: CAST-IN-PLACE STRUCTURAL CONCRETE.

#### 3.5.2 Dental Mortar

Mortar shall be used to fill joints, cavities, depressions, and overhangs when the width of the opening is less than 3 inches and one inch or greater, and at other areas as directed or approved. Openings smaller than one inch shall be opened to one inch in width and three inches in depth by appropriate methods. Placement of the sand-cement mortar will be

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

accomplished by troweling or brooming the mortar with stiff bristled brooms into the cleaned joints, cracks, and crevices so as to provide a thorough seal. The surface moisture of the rock shall be such that absorption of water from the mortar mix will be minimized. However, no standing water will be allowed. All mortar which cannot be worked into the joints, shall be removed from the rock surface. The mortar shall be moist cured for a period of at least 24 hours. The mortar and placement techniques shall conform with SECTION 3301: CAST-IN-PLACE STRUCTURAL CONCRETE.

### 3.6 Protective Coating.

Within 12 hours of excavation designated shale surfaces shall be coated with a commercial binder. These designated shale surfaces shall be vertical, horizontal, and sloped surfaces, against which concrete will be placed, or surfaces which require to be maintained during construction, such as the upstream intake basins. The coating shall be applied in accordance with the manufacturer's recommendations or as otherwise approved. The Contractor shall reapply the coating as necessary to repair damage caused by construction activities or when needed to provide adequate protection, as determined by the Contracting Officer. The binder shall be applied in two coats using full strength (46 to 48 % solids) as soon as possible after being exposed. Each coat of binder shall be applied at an angle to the rock surface. The coats shall be applied from a horizontal attitude and from opposite directions. The rate of application shall be determined by the Contracting Officer but in general will be at the rate of approximately 1 gallon per 50 square feet of surface covered. The binder used shall be Aerospray 52 Binder, as manufactured by Cytec Industries, West Paterson, New Jersey or equal. The methods by which the surface is prepared, and the methods of agitation and application shall all be as recommended by the manufacturer.

### 3.7 FOUNDATION INSPECTION AND GEOLOGIC MAPPING

Inspections to determine adequacy of the foundations will be performed by the Contracting Officer in all foundation areas between completion of excavation and placement of concrete treatment. The contractor will cooperate to the extent necessary to assist in inspection and mapping activities which may require additional survey control points and access. The contractor will coordinate his schedule for foundation excavation and preliminary cleanup with the Contracting Officer to insure that the cleanup, inspection, and mapping proceed in an orderly manner. The Contracting Officer will require 48 hours after final cleanup to complete geologic mapping.

-- End of Section --

SECTION TABLE OF CONTENTS

DIVISION 02 - SITE WORK

SECTION 02226

FOUNDATION BLASTING AND EXCAVATION

03/01

PART 1 GENERAL

- 1.1 GENERAL REQUIREMENTS AND SCOPE
- 1.2 REFERENCES
- 1.3 RECORDS OF SUBSURFACE EXPLORATIONS
- 1.4 SUBMITTALS
- 1.5 PAYMENT
  - 1.5.1 Common Excavation
  - 1.5.2 Conventional Rock Excavation
    - 1.5.2.1 Buffer Zone Excavation
    - 1.5.2.2 Special Excavation
    - 1.5.2.3 Excavation Adjacent to Structures
    - 1.5.2.4 Line Drilling
  - 1.5.3 Pre-Blast Survey
  - 1.5.4 Refill
- 1.6 LIMITS OF FOUNDATION EXCAVATION
  - 1.6.1 Rock Cleanup of Excavated Areas for Inspection
  - 1.6.2 Exploratory Drilling
  - 1.6.3 Drilled Shafts for Floating Mooring Bits
- 1.7 CLASSIFICATION OF EXCAVATION
  - 1.7.1 Conventional Rock Excavation
  - 1.7.2 Controlled Rock Excavation.
    - 1.7.2.1 Buffer Zone Excavation
    - 1.7.2.2 Special Excavation
    - 1.7.2.3 Excavation Adjacent to Structures
    - 1.7.2.4 Failure to Meet Requirements
- 1.8 Lock Operations During Contractor Work
- 1.9 Pre-Blast Public Meeting

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

- 3.1 OVERBURDEN EXCAVATION
- 3.2 BLASTING AND EXCAVATION IN ROCK
  - 3.2.1 Preblast Survey
  - 3.2.2 Historic Structures Near Project
- 3.3 TEST BLAST
- 3.4 CONVENTIONAL EXCAVATION
- 3.5 BLASTING

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

- 3.6 PRESPLITTING
- 3.7 STEMMING
- 3.8 SCALING
- 3.9 LINE DRILLING
- 3.10 BUFFER ZONE EXCAVATION
  - 3.10.1 Buffer Zone Dimensions
  - 3.10.2 Buffer Zone Blast Design
  - 3.10.3 Relief Zone
  - 3.10.4 Initial Shots to Depth
  - 3.10.5 Buffer-Zone Presplit
  - 3.10.6 Special Excavation
- 3.11 EXCAVATION ADJACENT TO EXISTING STRUCTURES
- 3.12 OVEREXCAVATION AND REFILL
  - 3.12.1 Overexcavation
  - 3.12.2 Refill
- 3.13 DRESSING AND TRIMMING
- 3.14 DISPOSAL OF ROCK MATERIALS
- 3.15 STORAGE AND USE OF EXPLOSIVES
  - 3.15.1 Magazines
  - 3.15.2 Magazine Keeper
  - 3.15.3 Blasting Specialist
  - 3.15.4 Daily Records
- 3.16 BLAST VIBRATION MONITORING
  - 3.16.1 Charge Weight
  - 3.16.2 Seismic Specialist
  - 3.16.3 Measuring and Recording Instruments
  - 3.16.4 Seismograph Operator
  - 3.16.5 Results of Monitoring
- 3.17 CLEARING OF MISFIRES

-- End of Section Table of Contents --



## SECTION 02226

## FOUNDATION BLASTING AND EXCAVATION

03/01

## PART 1 GENERAL

**\*1**

## 1.1 GENERAL REQUIREMENTS AND SCOPE

This section covers all operations in connection with rock excavation for the lock structure, gate bay structure, culvert excavation, and if necessary, removal of selected coffercells. **All drilling and sampling requirements must be met, as specified in SECTION 02210: Drilling and Sampling.** Additional excavation requirements are included in other sections, as appropriate. This section describes the various kinds of blasting and excavation required to accomplish the contract work and specifies the conditions under which the excavation is to be performed. Within the limitations of these specifications, plans, and in accordance with the construction sequence, the excavation may be carried out by any approved method and by any excavating and hauling equipment suitable for the work, as may be proposed by the Contractor and approved by the Contracting Officer or his authorized representative.

The Contractor shall conduct all blasting operations in conformance with KRS Sections 351.340, KAR Title 805 - Chapter 4, pursuant rules, laws, and regulations issued by the Department of Mines and Minerals, May, 1995, EM 385-1-1 Safety Manual, and specifications as specified herein. No blasting operations shall occur between the hours of 7 p.m. and 7 a.m. on any day of the week. In case of a conflict between the rules, regulations, and specifications, the more stringent shall apply as determined by the Contracting Officer. **\*1**

## 1.2 REFERENCES

The publications listed below form a part of these specifications to the extent referenced. The publications are referred to in the text by the basic designation only.

U.S. Army Corps of Engineers Publication.

EM 385-1-1 Safety and Health Requirements Manual

EM 1110-2-3800 Systematic Drilling and Blasting for  
Surface Excavations

**\*1 Reference has been deleted \*1**

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

State of Kentucky

KRS

Kentucky Revised Statutes

KAR

Kentucky Administrative Regulations

International Society of Explosives Engineers

Blaster's Handbook, 17th Edition

Blaster's Handbook, 17th Edition

### 1.3 RECORDS OF SUBSURFACE EXPLORATIONS

Records consisting of drive sampling, auger borings, and core boring data gathered to determine the characteristics of the materials at the site have been compiled by the Government. Subsurface geologic boring logs are shown on the drawings. Recent subsurface exploration samples that were not consumed during testing, field logs of borings, reports of investigations at the site, and other additional information, are available for examination by prospective bidders. Prospective bidders are encouraged to contact the Government to arrange for examination of all available data by contacting the Geotechnical and Dam Safety Section at (502) 315-6370. Because of its nature and quantity, this material must be examined at Government facilities in Louisville, Kentucky. These data represent the available subsurface information; however, variations may exist in the subsurface between boring locations. Portions of the McAlpine Project date to the 1830's and the site conditions have been impacted by multiple generations of construction. It should be noted by the bidder, that historical blasting has fractured the bedrock materials. It should be expected that these blast fractured bedrock characteristics shall be encountered during blasting and excavation of the foundation materials.

### 1.4 SUBMITTALS

Submittal and Approval Procedures. The Contractor shall make all submittals to the Contracting Officer no less than thirty (30) days, and many cases sixty (60) days, before the proposed date for the start of the item of work involved, and shall not start the item of work until said submittal is approved. The Contracting Officer will review the Contractor's proposal and approve the proposal when it meets the requirements of these specifications. The final decision for any proposal having provisions differing from the requirements of these specifications will rest with the Contracting Officer. Upon approval the Contractor shall not deviate from the proposal without the prior written approval of the Contracting Officer. Review and approval of proposals by the Contracting Officer does not relieve the Contractor of the responsibility for the work or the way in which it is performed. The Contractor acknowledges by submittal of this plan:

(1) That the Contractor has prepared bids based on his assessment of the nature and extent of the work involved;

(2) That he has determined that the design included in the

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

Excavation Plan includes sufficient allowance for variations normally encountered in earthwork and excavation;

(3) That the cost of the equipment proposed includes spares, backups, supplementary equipment as needed to complete the work; and

(4) That modifications of the Excavation Plan, directed by the Contracting Officer or found to be necessary by the Contractor, shall not constitute the basis of a claim unless such claim is specifically allowed by another provision of these specifications.

The submittal of items required in paragraphs, "Foundation Excavation Plan" through "Plan for Excavation Adjacent to Structures" below shall each be made under separate cover so as to prevent the undue delay of one proposal while another undergoes review and re-submittal.

Government approval is required for the submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with SECTION 01335 SUBMITTAL PROCEDURES:

## SD-08 Statements

Seismic Specialist; GA, ED.

The Contractor shall provide the Contracting Officer with seismic specialist's resume citing, in addition to other pertinent information, his past experience, training, and education. The Seismic Specialist shall have at least 5-years experience in similar blasting, including training in vibration control methods and the capability of analyzing results from blasting seismographs. The acceptability of the seismic specialist shall be subject to the approval of the Contracting Officer.

Blasting Specialist; GA, ED.

The Contractor shall submit the resume, experience, and training of the blasting specialist to the Contracting Officer. The submittal shall detail the experience and training which the Contractor believes qualifies the specialist for work under this contract. The Blasting Specialist shall have at least 5-years experience in similar blasting. The acceptability of the blasting specialist shall be subject to the approval of the Contracting Officer.

## SD-18 Records

Foundation Excavation Plan; GA, ED.

The Contractor has the flexibility under these specifications to employ a variety of excavating equipment. Accordingly, the Contractor shall prepare, for review by the Contracting Officer, an Excavation Plan that shall include but not be limited to: the type, location, and sequencing of excavating equipment; type, location, and sequencing of methods to be used; location of test sections to insure proper technique; the numbers of each

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

type of equipment to be used; the approximate vertical and horizontal limits of excavation for each type of equipment and method; the number and types of hauling equipment to be used; the proposed traffic patterns and haul road locations; and the location of required and proposed stockpile areas. The locations of haul roads and the sequence of operations such as stripping, exploration drilling, blasting, and excavation shall all be shown in detail in the Contractor's proposed Excavation Plan. Details of the excavation, disposal area, spoil, and any other aspect of the excavation and disposal of material within the required excavation shall be included in the Contractor's Excavation Plan whether or not specific requests are made elsewhere in these specifications. This submittal shall require 60 days for review and subsequent approval.

Blasting Plan; GA, ED.

The Contractor shall submit proposed plan for drilling and blasting of rock, for approval. The Contractor shall utilize the provided Excavation Method Plans as guidance to complete the detailed Blasting Plan. The Contractor's plan shall show the location and depth of holes, inclination of wedge cut holes, amount and strength of explosives per hole and per round, sequence of firing and time delays, and estimated length of pull per blast. All blasting operations shall be subject to approval. The Contractor shall submit for the Contracting Officer's review a plan detailing all the pertinent aspects of the blast designs including the type of explosives, loading, firing, delay sequence, and special considerations. The plan shall also address, if necessary, all pertinent aspects in blasting and removal of the selected concrete coffercells. The Contractor shall address his ability to adjust the blasting plan to changing geological characterizations within the foundation, including lithological changes, natural joints and fractures, as well as historically blast fractured bedrock. Government approval of the blasting plan shall not relieve the Contractor of any responsibility for the blasting operation. The blasting plan shall be completed and signed by a licensed blaster. This submittal shall require 60 days for review and subsequent approval.

Special Excavation Plan; GA, ED.

The Contractor shall submit a plan detailing the specialized procedures to be used for the excavation of the various gate sills, gate monoliths, culverts, etc. It shall address potential locations for test areas to determine the adequacy of the techniques. The special excavation plan shall be completed and signed by a licensed blaster. This submittal shall require 60 days for review and subsequent approval.

Buffer Zone Excavation Plan; GA, ED.

The Contractor shall submit a plan detailing the specialized procedures to be used for the buffer zone excavation of the various areas identified in the Excavation Plan Sheet and in the Contractor's submitted Foundation Excavation Plan. It shall address potential locations for test areas to determine the adequacy of the techniques. The buffer zone excavation plan shall be completed and signed by a licensed blaster. This submittal shall require 60 days for review and subsequent approval.

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

Plan for Excavation Adjacent to Structures; GA, ED.

The Contractor shall submit a detailed plan showing the specialized methods and procedures to be used for this type of excavation which may qualify as "Excavation Adjacent to Structures" as adapted for each specific application where this type of excavation is required. It shall address potential locations for test areas to determine the adequacy of the techniques. The plan for excavation adjacent to structures shall be completed and signed by a licensed blaster. This submittal shall require 60 days for review and subsequent approval.

Blasting Work Plan; GA, RE.

The Contractor shall submit detailed procedures that will be used when blasting. This includes personnel that will be involved with the blasting operations at the site, storage, and transportation of explosives, techniques and types of equipment to be used for blasting, blasting components, safety precautions, etc. The plan shall state procedures that shall be used to allow the uninterrupted passage of river traffic, including red flag barges. The blasting work plan shall be completed and signed by a licensed blaster. This submittal shall require 60 days for review and subsequent approval.

Blast Vibration Monitoring Plan; GA, ED.

Submit detailed procedures for monitoring blast. Plan shall include type of equipment, locations and mounting of equipment for each blast, and qualifications of personnel. Reference is made to 805 KAR 4:030. The blast vibration monitoring plan shall be completed and signed by a licensed seismic specialist. This submittal shall require 30 days for review and subsequent approval.

Safety Plan; GA, RE.

The Contractor shall submit a safety plan as specified in COE EM 385-1-1. The safety plan shall consider the general public, as well as the contractor and site personnel, explosive storage, transportation, handling. The safety plan shall be completed and signed by a licensed blaster. This submittal shall require 30 days for review and subsequent approval.

**\*1**

Pre-Blast Survey; GA, RE.

Submit a record of pre-blast survey performed on major structures near the work area, and **as listed in paragraph 3.1.2 Pre-blast Survey**. The pre-blast survey shall be completed prior to the start of any blasting. **\*1**

Blast Records; GA, RE.

Submit a record of each blast on the project. Information shall be the same as required by 805 KAR 4:050. Completed blast records, including printed seismic and airblast data, shall be submitted to the Contracting Officer within 1 hour after each blast.

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

Blast Notification; GA, RE.

Submit a record of all utility, property owners, etc, who have been contacted, and by what means they have been contacted, in regards to the use of explosives as the project.

#### 1.5 PAYMENT

A survey of the site shall be made just after commencement of the work under this contract and prior to the initiation of any excavation. All measurements for payment for excavation will be based on that survey and additional surveys as specified hereinafter without regard to any changes that may occur during the prosecution of the work. Quantities for payment for excavation will be determined in cubic yards based on cross-section measurements. All quantity computations for excavation payment will be made using the average end area method from cross-sections taken at suitable intervals. All decisions concerning classification of the excavated materials will be made by the Contracting Officer. Payment for excavation will be made only for the volume of materials actually removed by the Contractor, and only for the material excavated within the limits shown on the drawings or established in the field by the Contracting Officer. Payment for any given volume of excavation will not be made under more than one classification of excavation. Payment for excavation will constitute full compensation for all costs associated with removal, hauling, stockpiling, and disposal of the excavated materials.

##### 1.5.1 Common Excavation

Common excavation will be conducted and measured for payment as described in SECTION 02300, EARTHWORK.

##### 1.5.2 Conventional Rock Excavation

Rock excavation will be measured for payment based on the volume of material between the top of rock established in the field by the Contracting Officer, and the grade lines as shown on the drawings or as modified in the field by the Contracting Officer, or to the surfaces where the classification changes, which ever is applicable. Where the character of the materials and the methods of removal do not qualify a given volume of rock excavation for payment under one of the special classes of rock excavation, measurement and payment will be made for "Conventional Rock Excavation". Payment will be made at the contract price per cubic yard for "Conventional Rock Excavation" which price shall constitute full compensation for all labor, materials, equipment, blasting, stockpiling, and miscellaneous items which are necessary to complete the work as specified.

##### 1.5.2.1 Buffer Zone Excavation

Buffer zone excavation will be measured for payment based on the volume of rock excavated using the specified buffer zone techniques in areas designated for this type of excavation, including pre-splitting, stemming, etc. Payment will be made at the contract price per cubic yard for "Buffer Zone Excavation" which price shall constitute full compensation for all

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

labor, materials, equipment, blasting, stockpiling, and miscellaneous items which are necessary to complete the work as specified.

## 1.5.2.2 Special Excavation

Special excavation will be measured for payment based on the volume of rock excavated using the specified special excavation techniques in areas designated for this type of excavation, including pre-splitting, mechanical excavation, etc. Payment will be made at the contract price per cubic yard for "Special Excavation" which price shall constitute full compensation for all labor, materials, equipment, blasting, stockpiling, and miscellaneous items which are necessary to complete the work as specified.

## 1.5.2.3 Excavation Adjacent to Structures

Excavation adjacent to structures will be measured for payment based on the volume of rock excavated using the specified techniques in areas designated for this type of excavation, including pre-splitting, mechanical excavation, etc. Payment will be made at the contract unit price per cubic yard for "Excavation Adjacent To Structures" which price shall constitute full compensation for all labor, materials, equipment, blasting, stockpiling, and miscellaneous items which are necessary to complete the work as specified.

## 1.5.2.4 Line Drilling

Line drilling will be measured for payment based on the number of square yard of permanent rock face formed using line drilling techniques as previously specified. Line drilling performed at the Contractor's option, in areas other than those designated in the specifications or directed by the Contracting Officer, will not be measured for payment. Payment for line drilling will be made at the contract price per square yard for "Line Drilling" which price shall constitute full compensation for all labor, materials, equipment, and miscellaneous items which are necessary to complete the work as specified.

## 1.5.3 Pre-Blast Survey

Payment for pre-blast surveys will be made at the applicable contract lump sum price for "Pre-Blast Survey" as listed in the Bidding Schedule which price shall include the cost of all plant, materials, labor, and equipment for performing pre-blast surveys.

## 1.5.4 Refill

Refill will be measured for payment based on the number of cubic yards of concrete used as refill in a vertical wall made necessary by overexcavation which is not due to fault or negligence on the part of the Contractor, as paid for under contract unit prices in SECTION 03700: MASS CONCRETE.

## 1.6 LIMITS OF FOUNDATION EXCAVATION

The limits of the proposed foundations for the various parts of the work are approximately as indicated on the drawings. The Contracting Officer

reserves the right to change the depth to, or the width of, the foundations if, in the opinion of the Contracting Officer, conditions exposed in the foundation excavations, or as determined by exploratory drilling, warrant such modifications. The limits of foundation excavation can only be changed by obtaining authorization from the Contracting Officer. Where such modifications are made, the Contractor shall not be entitled to any compensation beyond contract unit prices.

#### 1.6.1 Rock Cleanup of Excavated Areas for Inspection

Inspection may be necessary at various stages of the excavation operations in order to determine the condition of the rock and the requirements for further excavation. The work required to perform this cleanup will be conducted, measured and paid in accordance with Section 02217: Foundation Preparation.

#### 1.6.2 Exploratory Drilling

The Contractor, as directed by the Contracting Officer, shall perform such exploratory drilling as may be required to determine the condition of the rock before, during, or after excavation operations in a given area. All exploratory drilling shall be performed in accordance with SECTION 02210: Subsurface Drilling, Sampling, and Testing. When conducting exploratory drilling before foundation excavation, the drilling shall be conducted at least 300 feet ahead of the foundation blasting and excavation.

#### 1.6.3 Drilled Shafts for Floating Mooring Bits

Drilled shafts to be used for the mooring bits, located within the footprint of the RCC monoliths, shall be drilled to full depth before the conventional excavation or buffer zone excavation in the lock chamber. These drilled shafts shall be such size to accommodate the floating mooring bit dimensions, as shown in the plans, with no hindrance in movement during operation. The diameter of the shafts shall be 46-inches in diameter, have the shaft center located at the same location as the center of the mooring bit recess within the monolith, and have a minimum functional bottom elevation of 367. The shafts shall meet tolerance criteria set in SECTION 02466, DRILLED SHAFTS. After the lock chamber excavations in front of these shafts have reached the required founding elevation, a rock wedge between the front of the blast face back to the shafts shall be removed by mechanical means. This slot shall be removed from the top of rock down to the bottom of the chamber excavation, approximately elevation 367 (as depicted on sheet F-22). The drilled shafts shall be cleaned and prepared to remove all loose rock from the sides of the shafts and all loose debris from the bottom of the shafts. Drilling for these shall be conducted and payment measured as determined in SECTION 02466: DRILLED SHAFTS. Cleaning of these shafts shall be conducted and payment measured in accordance with SECTION 02217, Paragraphs 1.2.1 and 3.3.

#### 1.7 CLASSIFICATION OF EXCAVATION

Excavation will be classified for the purpose of payment on the basis of the character of the materials removed and the methods employed for their removal as specified in the following paragraphs.



The Contractor shall excavate to the lines, grades, and slopes shown on the drawings or as otherwise specified or directed. When, during the progress of the excavation, material is encountered with respect to which the Contractor may claim classification as rock excavation, such material shall be uncovered and exposed for examination by the Contracting Officer, and the Contracting Officer notified by the Contractor, before proceeding further. The Contractor shall not proceed with the excavation of the material claimed as rock until the material in question has been classified by the Contracting Officer and cross-sectioned by the Contractor. Failure on the part of the Contractor to uncover such material, notify the Contracting Officer, and allow ample time for cross-sectioning the undisturbed surface of such material, will forfeit the Contractor's right of claim to any classification other than earthwork as defined and paid under SECTION 02300: EARTHWORK. The classification of excavated material will be determined by the Contracting Officer. The excavation of earthen materials below top of rock, or excavation by ripping of materials below top of rock will not preclude payment for the excavated material under a classification of rock excavation.

#### 1.7.1 Conventional Rock Excavation

The removal of all materials required to be excavated that require continuous systematic blasting, ripping, wedging, or hoe-ramming will be classified as rock excavation. This includes loose boulders and rocks 1 cubic yard or larger. It also includes soft rock and earthen materials encountered below top of rock as determined by the Contracting Officer. Limiting or prohibiting the use of explosives by these specifications or by the Contracting Officer will not preclude application of the classification of rock excavation to the removal of the material for which explosives otherwise would have been used. Guide holes and pre-blast reinforcement may be required to preserve the rock in some areas, for example at corners. The foundation excavation will proceed generally, and as far as practical, by benching from lower into higher areas. The Contractor may elect to use conventional methods to excavate all materials down to elevation 370. All material below elevation 370 shall be removed by the methods determined on the plans. Where the character of the materials and the methods of removal do not qualify a given volume of rock excavation for payment under one of the classes of specialized rock excavation, measurement and payment will be made for "Conventional Rock Excavation".

#### 1.7.2 Controlled Rock Excavation.

Controlled rock excavation shall be defined as the excavation conducted with extraordinary care to ensure that the requirements imposed upon the excavation are met.

##### 1.7.2.1 Buffer Zone Excavation

"Buffer Zone Excavation" shall be defined as excavation of rock, using the techniques specified below in paragraph, "Buffer Zone Excavation," in those areas which are shown on the plans and designated as a "Buffer Zone." The Contracting Officer may direct that additional areas be excavated using buffer zone techniques, in which case those areas will also be classified

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

as "Buffer Zone Excavation".

#### 1.7.2.2 Special Excavation

"Special Excavation" shall be defined as the excavation of rock, using the techniques specified below in paragraph, "Special Excavation" to a vertical surface against which the concrete for the various gate sills in the locks will be placed. Excavation of the rock thus defined will be classified as "Special Excavation".

#### 1.7.2.3 Excavation Adjacent to Structures

"Excavation Adjacent to Structures" shall be defined as the excavation of rock, using the techniques specified below in paragraph, "Excavation Adjacent to Structures," in those areas which are shown on the plans and designated as "Excavation Adjacent to Structures." The Contracting Officer may direct that additional areas be excavated using these techniques, in which case those areas will also be classified as "Excavation Adjacent to Structures".

#### 1.7.2.4 Failure to Meet Requirements

Failure on the part of the Contractor to meet the requirements imposed upon the controlled rock excavations will result in the Contractor forfeiting the right of claim to any classification other than "Conventional Rock Excavation".

### 1.8 Lock Operations During Contractor Work

All work by the Contractor will be adjacent to a lock continuously operated in the passage of waterway traffic. The Contractor's operations shall in no way interfere with these operations of the lock or adversely affect waterway traffic. The Contractor, therefore, must stop work, or take whatever measures are necessary to allow river traffic to pass through the locks uninterrupted. The Contractor must also meet the requirements in this Section, Paragraph 3.5.

### 1.9 Pre-Blast Public Meeting

The Contractor's representative, the blaster in charge, and the seismic specialist shall be present at the public meeting to be conducted as specified in Section 0800 of these specifications.

## PART 2 PRODUCTS (NOT USED)

## PART 3 EXECUTION

### 3.1 OVERBURDEN EXCAVATION

Overburden excavation shall be conducted as required in SECTION 02300: EARTHWORK.

### 3.2 BLASTING AND EXCAVATION IN ROCK

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

All blasting and excavation shall conform to the following; EM 1110-2-3800; ETL 1110-1-142; KRS; KAR; and Blaster's Handbook, 17th Edition. Excavation of the rock cut slopes shall be accomplished by special techniques and with special care, so that the remaining rock surfaces will be resistant to rock fall, adverse effects of weathering, and be fully competent for placement of concrete. The Contractor shall take such precautions as are necessary to prevent cracking or damaging the rock or concrete outside the prescribed limits of excavation, and foundations or structures outside the limits of the excavation shall be left in a sound condition. These remaining surfaces shall be cut and dressed to plane surfaces by line drilling and presplitting excavation methods supplemented where and as necessary by hand and air tool dressing and trimming. No separate payment will be made for presplitting, cutting, dressing, and trimming the slopes, the costs for such work being included in the contract price for the rock excavation.

\*1

### 3.2.1 Preblast Survey

Prior to commencing drilling rock, masonry structures, or concrete structures, the Contractor shall complete and submit to the Contracting Officer a preblast survey which shall include at a minimum the following:

- The 1200' lock chamber and all existing support structures,
- The south wall of the 600' lock chamber,
- All structures between the north wall of the auxiliary lock chamber and the 1200' lock chamber,
- All structures at the Louisville Repair Station,
- All privately owned property and structures, as well as state and local government owned facilities in the area bounded by 22nd street, I-64, Portland Avenue, North Western Parkway, and the left descending bank of the Ohio River,
- The LG&E Swing Bridge over the 600' and 360' lock, its abutments and center support pier,
- The bascule bridge over the 1200' lock,
- The underground brick sanitary sewer within 1000 feet of any blasting,
- Any other underground or surface utilities within 1000 feet of any blasting.

The preblast survey should include the condition, type, construction, and condition of the exterior and interior of each structure, and shall also consider any sensitive equipment such as computers or electronic equipment, as well as fragile personal items. Still color photographs shall be used for visual documentation. The use of video cameras will not be permitted. The Contractor's blaster in charge shall be responsible for reviewing the preblast survey conducted for the project.

### 3.2.2 Historic Structures Near Project

The McAlpine site is located near historic structures and districts. The following historic structures are located near McAlpine; U.S. Marine Hospital at 2215 Portland Avenue; Greve, Buhrlage, and Company at 1501 Lytle Street; James F. Irvin House at 2910 Northwestern Parkway; Meek-Miller House at 3123 Northwestern Parkway; Montgomery Street School at 2500-2506 Montgomery Street; and Peaslee-Gaulbert Warehouse at 1427 Lytle

Street. The following Historic Districts are located near McAlpine; The Portland Historic District, roughly bounded by Missouri Alley, Pflanz Avenue, Bank Street, North 33rd, and North 37th Streets; The Proposed Portland Avenue Extension of the Portland Historic District roughly bounded by Portland Avenue, 32nd Street, and Northwestern Parkway; and the Proposed Portland Avenue/N. 26th Street Historic District roughly bounded by Portland Avenue, 22nd Street, Lytle Street, Gilligan Alley, Xavier Street, and Bank Street. Historic structures and historic districts may be within the influence of blasting. Additional information regarding historic structures may be obtained by contacting the Planning Division, Environmental Analysis Branch of the Louisville District at (502)315-6900 or (502)315-6872. \*1

### 3.3 TEST BLAST

At the beginning of blasting, a test blast section for each type of blasting in each lithological type shall be performed, and the pattern and charges shall be conservative to avoid damage beyond the blast limits. No excavation shall be taken to the excavation limits shown on the drawings, before the blasting techniques have been proven successful and approved by the Contracting Officer.

### 3.4 CONVENTIONAL EXCAVATION

Conventional excavation shall be understood to refer to the systematic drilling, loading, and firing of blast holes so as to break the rock mass into pieces small enough to be removed by standard excavating equipment. Conventional excavation may be used for the removal of rock except for those locations which are scheduled for removal by alternate methods, as noted by the Excavation Method Plan or as directed by the Contracting Officer. Care shall be taken to prevent damage to the rock integrity outside the excavation limits, which will remain in place and provide structural stability, including presplit or line drilled faces. Additional requirements for production blasting are contained in paragraphs, "Buffer Zone Excavation," "Special Excavation," and "Excavation Adjacent to Existing Structures".

### 3.5 BLASTING

The Contractor shall closely coordinate his daily blasting operations with the Contracting Officer who will, in turn, coordinate with the project Lockmaster. No blasting shall be conducted when a barge is within the operating lock chamber. No blasting shall be conducted when a red-flag barge is within 1,000 feet upstream or downstream of the operating lock chamber. Prior to each blast the Contractor shall submit for the Contracting Officer's approval a plan detailing all the pertinent aspects of the blast design including the loading, firing, delay sequence, coordination of presplit and production blasting and special consideration.

The Contractor's plan shall show the location and depth of holes, type of explosive, inclination of wedge cut holes, amount and strength of explosives per hole and length of pull per blast. All blasting operations shall be subject to the approval of the Contracting Officer. The depth and the spacing of the blast holes shall be determined by observation of the manner in which the rock breaks in the Test Blasting and as the

operations progress. Lift heights shall be limited to a maximum of twenty (20) feet. Blast holes other than holes used for presplitting shall not be drilled to depths greater than 2/3 the depth to grade, except that drilling to full depth may be permitted where that depth is less than seven (7) feet, provided that the bottom of the hole is padded with at least 6-inches of sand. When blasting near concrete structures, the Contractor shall conform to requirements in this Section, Paragraph 3.11.

The Contractor shall take such precautions as are necessary to prevent cracking or damaging the rock outside the prescribed limits of excavation, so the rock outside the limits of the excavation shall remain as sound and undamaged as possible. All presplit and production blasting shall be initiated by a nonelectric method such as the shock tube initiation system.

The use of bulk explosives such as ammoniated prills will not be permitted during the excavation for the foundations of the various concrete structures unless positive measures are taken to prevent its mixing with water and the uncontrolled spread of the blasting agent into subsurface cracks, caverns, or cavities. Approval of the method of blasting by the Contracting Officer shall not relieve the Contractor of his responsibility for his blasting operations. When the Contractor sees fit, or the Contracting Officer so directs, the Contractor shall cover all shots in open cut excavations.

### 3.6 PRESPLITTING

Presplitting shall be performed in accordance with the methods proposed by the Contractor and approved by the Contracting Officer or his authorized representative. Presplit holes shall be 2-1/2- to 3-inches in diameter, spaced 18- to 24-inches center to center, except where concrete is to be placed against the presplit faces the spacing of the holes shall not exceed 18 inches center to center. The holes shall be drilled no deeper than the required final elevation of the excavation. Presplit holes shall be drilled with equipment which is capable of maintaining the alignment and plane of the presplit pattern throughout the full depth of the drilled holes. The holes shall not vary by more than 1 degree in any direction from the intended plane. Presplitting shall be performed on all final lines and grades which are to remain for concrete placement. Locations of presplit holes shall be such that the 95% of the holes shall be within one hole diameter of the staked location. Presplitting shall be performed in such a manner that all faces and floors remaining will be undisturbed rock, and that the faces and floors shall be within 6 inches of the lines and grades established in the plans or directed by the Contracting Officer. Except that where concrete is to be placed against the presplit face, the rock shall not project inside the neat lines shown on the drawings for the concrete structure. The Contractor should be aware that the excavation will require presplitting many inside and outside corners which may necessitate a modification of the drilling pattern or the use of unloaded guide holes to prevent overbreakage. Unloaded and unstemmed guide holes, when used between presplit holes, shall be of the same diameter and in the same plane and to the same tolerance as the presplit holes. All presplitting for final monolith configuration shall extend to final grade except in intermediate lifts, where set back is necessary to achieve final monolith grade.

### 3.7 STEMMING

Variations from hard to soft rock with depth will require the Contractor to stem the blast holes through soft rock areas so care should be taken in classifying the rock while drilling the blast holes. Holes shall be stemmed with crushed limestone having a maximum size of 3/8-inch. Drill cuttings, clay, pea gravel, sand, or dirt shall not be used as stemming. No separate payment will be made for stemming.

### 3.8 SCALING

The Contractor will be required to scale any loose material remaining on the vertical excavation face. The work shall be done immediately after each lift of the interior rock mass is removed by production blasting. The removal shall be accomplished by compressed air or water jetting, pry bars, rock picks, and/or other means as approved by the Contracting Officer. No separate payment shall be made for scaling.

### 3.9 LINE DRILLING

Line drilling shall be performed in accordance with the methods proposed by the Contractor and approved by the Contracting Officer or his authorized representative. Line drilled holes shall be 2- to 3-inches in diameter. The spacing of the drilled holes shall not be more than twice the hole diameter, center to center, along the excavation lines as shown on the drawings. The holes shall not vary by more than 1 degree in any direction from the intended plane. The line drilled holes shall be drilled with equipment capable of maintaining the alignment and plane of the of the drilled hole throughout the full depth of the holes. Locations of presplit holes shall be such that the 95% of the holes shall be within one hole diameter of the staked location. Line drilling shall be performed in such a manner that the faces remaining shall be undisturbed rock, and that the faces shall not project inside the excavation lines as shown on the drawings. Line drilling shall be performed on all outside corners of foundation excavation or as directed by the Contracting Officer. From an outside corner, a minimum of 3-feet on each adjacent remaining face, as well as 3-feet past the corner into rock to be removed, shall be line drilled. Line drilling or guide holes shall be utilized while blasting inside corners to ensure the remaining rock faces are intact and competent.

### 3.10 BUFFER ZONE EXCAVATION

"Buffer zone excavation" shall be understood to refer to the excavation, using the specified techniques, of those areas which are shown on the plans and designated as a "Buffer Zone." Blasting in these areas shall not be performed until a relief zone is provided in front of the shot which is designed to remove the buffer zone. Where special excavations and buffer zone excavations lie adjacent to each other, the buffer zone excavation shall be completed before the special excavation at any given elevation.

#### 3.10.1 Buffer Zone Dimensions

The buffer zone shall be a section of rock the width of which is measured perpendicular to the cutslope which will remain after the buffer zone

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

excavation. The width of the buffer zone shall be fifteen feet, unless otherwise shown on the drawings or specified in paragraph, Relief Zone. The buffer zone shall extend across the full length of the monolith parallel to the cutslope which will remain after the excavation of the buffer zone. The buffer zone shall extend from top of rock down to the founding elevation of the monolith at the location of the buffer zone.

### 3.10.2 Buffer Zone Blast Design

Blast design for those areas designated for buffer zone excavation shall be such that the least amount of explosives is used, commensurate with loading and hauling by conventional equipment. The fragmentation shall be such that additional effort and care must be taken in the removal of the blasted material to prevent an inordinate amount of wear and tear to the equipment.

The experience base to be used for determining the proper amount of explosives shall be gained through test blasting during the excavation of the adjacent materials which are not scheduled for buffer zone excavation. The Contractor shall propose test blasts to determine appropriate buffer zone blast designs through submittal of plans to the Contracting Officer. Trial and error methods shall not be used while conducting the buffer zone excavation itself. Conventional presplit methods are considered to be adequate for the purposes at hand, provided that complete relief is available for any and all buffer zone shots. Failure to provide complete relief for the buffer zone excavations may result in the need to revise base widths and or excavation limits. The depth of each blast in the buffer zone shall be limited to 20-feet or less and no subdrilling will be permitted.

### 3.10.3 Relief Zone

The relief zone which is to be provided shall extend to the full depth and width of the blast and for a minimum distance of at least 10 feet in front of the blast. If as the work progresses it becomes necessary, the Contractor shall expand the relief as may be required to provide total relief for the shot and prevent damage to the remaining cutslope. Where buffer zones are shown for both faces of a monolith excavation and, in the opinion of the Contracting Officer, the resulting limitations in work space preclude the use of buffer zone techniques as herein specified, the width of the buffer zone shall be cut in half. Where the buffer zone has been reduced in width because of space limitations, the preceding shots to provide a relief zone shall be presplit and delayed in a "V" pattern and additional care shall be taken to ensure that the rock in the buffer zone is not damaged.

### 3.10.4 Initial Shots to Depth

Where initial shots are required to reach a given depth for the first time in a given area, these shots shall be carefully designed and located to prevent damage to the buffer zone and future presplit faces. Final presplit lines shall not be shot with these initial shots to depth but shall be made when sufficient relief has been provided to prevent damage by the presplit blasting.

### 3.10.5 Buffer-Zone Presplit

Presplit lines which are required for the buffer zone excavation shall be drilled, loaded, and shot along with their respective buffer zone, except that when full depth relief is provided, the presplit may be drilled and shot to the full depth of the excavation. Where relief is not provided for the full depth of the excavation and presplit blasting is required for each lift, the Contractor shall be responsible for setting back the upper presplit lines to provide for the neat line configuration shown on the plans. Where setting back is necessary the Contractor shall replace that material outside the neat line with appropriate concrete at his own expense.

#### 3.10.6 Special Excavation

Excavation of those areas on or against which the concrete for the various lock gate sills and culverts will be placed will require specialized procedures to protect the rock that will remain in place. Special excavation in the locks shall consist of light blasting supplemented by mechanical methods so that fragmentation will not be the controlling factor in the design of the blast. The blast shall be designed so that the rock is broken but the fragment size is such that removal by conventional excavating equipment is not possible without the use of supplementary mechanical methods such as hydraulic rock splitters, impact hammers, or boom-mounted demolition hammers such as those manufactured by Kent Demolition Tools, 711 Lake St., Kent, Ohio or equal. Special excavation in the locks shall be performed in a manner such that the surfaces against which the lock sills and culverts are to be placed are free from defects caused by the excavation methods, and such that the pre-existing defects in the rock will not be aggravated by the method of excavation. Where special excavations in the locks and buffer zone excavations lie adjacent to each other, the buffer zone excavation shall be completed before the special excavation at any given elevation. Additional requirements for special excavation are contained in paragraphs, Line Drilling, and Buffer Zone Excavation.

#### 3.11 EXCAVATION ADJACENT TO EXISTING STRUCTURES

Excavation adjacent to structures shall be performed with extra care in order to ensure that the materials remaining after the excavation are undamaged by the excavation process. In order to accomplish this the backwall of the excavation shall be line drilled. After line drilling the excavation shall be performed using boom-mounted demolition hammers and other non-explosive type excavation techniques. The minimum required width for this zone of excavation is five feet measured at right angles to the face which will remain after the excavation. No blasting of any kind shall be performed within 100 feet of any concrete or grout that is less than 14 days old nor concrete or grout that has not achieved 1000 psi compressive strength. Blasting within 50 feet of any concrete shall be performed using line drilling, presplit, blasting mats, or other measures as identified in the Blasting Plan to prevent damage to the concrete. Blasting conducted near the existing 600-foot lock shall not cause damage to the concrete structure or cause rock beneath its foundation to become loose and undermine its foundation. No blasting of any kind shall be performed within 25 feet of the swing bridge or its abutments until the new fixed bridge is constructed and in service and the swing bridge is taken out of operation.



## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

Great care shall be taken to ensure no damage is imposed on the swing bridge pier and abutments during blasting and excavation.

## 3.12 OVEREXCAVATION AND REFILL

## 3.12.1 Overexcavation

Where overexcavation and subsequent refill in a vertical wall are made necessary through fault or negligence on the part of the Contractor no additional payment will be made for the excavation or refill. Where overexcavation and subsequent refill in a vertical wall is made necessary through no fault or negligence on the part of the Contractor, the excavation and refill will be paid for at contract unit prices. In order to receive payment under this item the Contractor must clearly demonstrate that there was a pre-existing defect in the rock which caused the overexcavation, or that the overexcavation was necessary for the safety of the workmen. Failure on the part of the Contractor to uncover such material, notify the Contracting Officer, and allow ample time for cross-sectioning the undisturbed surface of such material, will forfeit the Contractor's right of claim to any classification other than "Earthwork".

## 3.12.2 Refill

Refill in a vertical wall made necessary by overexcavation which is not due to fault or negligence on the part of the Contractor will be paid for under contract unit prices in SECTION 03700: MASS CONCRETE. The Contracting Officer will direct whether the refill material will consist of lean concrete or backfill materials similar to the adjacent backfill materials. Concrete placements made necessary under this provision shall not qualify for payment as dental treatment. Any additional refill and forming the surface between the monolith concrete and rock excavation made necessary by overexcavation shall be solely performed at the Contractor's expense.

## 3.13 DRESSING AND TRIMMING

Loose, fractured, or projecting rock shall be removed from the slopes by picking, barring, air tooling, or light blasting. Excavated surfaces shall be washed down with water prior to placement of the adjacent concrete, as specified in Section, CONCRETE.

## 3.14 DISPOSAL OF ROCK MATERIALS

All disposal of rock materials shall be conducted in an off-site disposal areas as approved by the Contracting Officer. The Contractor shall be responsible for obtaining all proper permits and meet disposal requirements of SECTION 1410: Environmental Protection, and the requirements of the disposal facility.

## 3.15 STORAGE AND USE OF EXPLOSIVES

General. Explosives shall not be stored at the site overnight. The Contractor shall store explosives at an offsite location and transport the explosives to the site daily, as needed. Explosives shall be stored, handled, and used in accordance with the best practice as approved by the

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

Contracting Officer and in accordance with all Federal, state, and local laws and regulations. The Contractor shall comply with all special rules and regulations that may be made by the authorities having jurisdiction, or by the Contracting Officer, regarding construction of and storage in magazines, precautions in blasting, and the like. The Contractor will be responsible for all claims for damage caused by or arising out of the blasting. All blasting operations shall be performed in accordance with the current edition of EM 385-1-1, Safety and Health Requirements Manual.

## 3.15.1 Magazines

Explosives shall be stored in suitable magazines in an approved location. Detonators shall be kept in a separate magazine. Each magazine shall have around it a cleared area suitably barricaded and maintained so that fire cannot spread to the magazine area.

## 3.15.2 Magazine Keeper

Each magazine keeper shall be competent, trustworthy, sober, and familiar with the laws and general practices concerning the handling, care, use, and storage of explosives and detonators. The magazine keeper shall also be responsible for maintaining a cleared area around each magazine. No magazine keeper shall be required to perform any duties that will in any way interfere with his duties as magazine keeper.

## 3.15.3 Blasting Specialist

The Contractor shall employ a qualified blasting specialist experienced and trained in the types of blasting required in this Section. The blasting specialist must have at least five years of experience in blasting specifically applicable to this job.

## 3.15.4 Daily Records

Accurate daily records shall be kept by the magazine keepers who shall account for each piece of explosive, detonator, and equipment from the time of delivery at the magazine until its discharge in use. No explosive shall be accepted until it has been plainly labelled and delivered as new stock in sound condition. Containers for explosives shall be approved in advance by the Contracting Officer. Drilling and blasting operations shall be conducted at such times and under such restrictions and conditions as the Contracting Officer approves.

## 3.16 BLAST VIBRATION MONITORING

General. Vibration monitoring of all blasts is required of the Contractor.

The blasts shall be monitored to ensure that the peak particle velocity measured at the nearest structure outside the Contractor's work area and at the swing bridge pier does not exceed 1 inch per second, and that the peak particle velocity measured at the nearest structure within the Contractor's work area does not exceed 4 inches per second.

## 3.16.1 Charge Weight

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

Charge Weight. The maximum charge weight per delay can be approximated by the use of the following equation which will require refinement based on experience gained as the work progresses:

$\text{Log } W = 1.25 \text{ Log } V - 2.7551 + 2 \text{ Log } R$ , where

V = peak particle velocity, in inches per second

R = shortest distance between blast and the point of interest, in feet

W = maximum weight of explosives per delay period of eight milliseconds or more, in pounds.

### 3.16.2 Seismic Specialist

The Contractor shall employ a qualified seismic specialist trained in vibration control methods and capable of analyzing results obtained from blasting seismographs.

### 3.16.3 Measuring and Recording Instruments

The Contractor shall provide at least four (4) instruments within the Contractor's work limits and a minimum of two (2) instruments outside the Contractor's work limits. The instruments shall meet with specifications equal to the Series II or higher, seismometer, available from InstanTel or equal. Within the Contractor's work limits, one seismometer shall be on the swing bridge pedestal, located on a side closest to blasting activities, and one seismometer shall be on the north-middle wall of the operating lock, located adjacent to any blasting activities. Outside the Contractor's work limits, the seismometers shall be placed to monitor blasting effects on the Louisville Gas and Electric Company facility to the north and the Portland Community to the south. The units must be self-contained except for external geophones and microphones, and must be capable of providing a printout of each blast. The units shall be programmed with specific data on each site of placement. The Contractor shall also provide a minimum of two (2) airblast recorders.

### 3.16.4 Seismograph Operator

The seismograph operator shall be a qualified person capable of setting the instrument up at designated locations and effectively recording the blast.

### 3.16.5 Results of Monitoring

The original printed results of vibration monitoring in the form of peak readings and frequencies for each blast shall be presented to the Contracting Officer prior to any further drilling or blasting. The original records shall be maintained by the Contractor and copies shall be provided to the Contracting Officer. No drilling or blasting shall be conducted before the results from the previous blasting have been furnished to the Contracting Officer. Instruments that provide only peak readings from an analog view-meter type display will not be acceptable. Results in the form of peak readings will be acceptable provided they are obtained from the vibration record and not from a separate device as previously mentioned.

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

The Contractor shall take all necessary precautions to assure that the peak readings available from the vibration record are accurate to the maximum extent possible, as defined by the manufacturer of the equipment. On an annual basis, and more often if necessary, the equipment, including peak readout, shall be certified by the manufacturer to be within acceptable calibration limits. In addition, the airblast limit associated with blasting activities shall not exceed 133 decibels.

## 3.17 CLEARING OF MISFIRES

The Contracting Officer shall be notified immediately of any misfire and all work in the area shall be stopped. The blast area should then be cleared in accordance with the industry standards, and in accordance with the explosive manufacturer's recommendations. The misfire shall be cleared by the blaster-in-charge, or the blaster designing and detonating the blast. Only the individuals necessary for clearing the misfire shall be present until the misfire is cleared. The misfire shall be documented with the blast record including the manner in which the misfire was cleared and any corrective actions.

-- End of Section --

SECTION TABLE OF CONTENTS

DIVISION 02 - SITE WORK

SECTION 02240

SANDSTONE BENCHES AND BOLLARDS

11/01

PART 1 GENERAL

- 1.1 SCOPE OF WORK
- 1.2 SUBMITTALS
- 1.3 QUALIFICATIONS
- 1.4 MEASUREMENT AND PAYMENT

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION

- 3.1 CUTTING AND GRINDING OF SANDSTONE
- 3.2 INSTALLATION
- 3.3 CLEAN-UP

-- End of Section Table of Contents --

SECTION 02240

SANDSTONE BENCHES AND BOLLARDS

11/01

PART 1 GENERAL

1.1 SCOPE OF WORK

Sandstone to be used for this project was previously removed from existing work and stock piled at the site. The Contracting Officer will direct the contractor where to obtain the stone. Contractor shall cut and grind the sandstone for benches and bollards as detailed on the drawings.

1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01335 SUBMITTAL PROCEDURES:

SD-04 Drawings

Cutting and Grinding stone; GA, ED.

Detail drawings showing individual stones to be cut and ground smooth for the intended uses.

SD-18 Records

Work Plan; GA, ED.

The procedures proposed for the accomplishment of the work. The procedures shall provide for safe conduct of the work, careful removal and disposition of materials to be relocated, and coordination with other work in progress. The procedures shall include a detailed description of the methods and equipment to be used for each operation, and the sequence of operations.

1.3 QUALIFICATIONS

Contractor shall list similar projects where movement and placement of large stones was performed. A current point-of-contact for identified references shall be provided. The Contractor shall provide qualified workers trained and experienced in cutting, polishing, handling large blocks of stone.

1.4 MEASUREMENT AND PAYMENT

No separate payment will be made for the work covered under this section

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

and all costs in connection therewith shall be included in the lump sum price for "Visitor Overlook".

## PART 2 PRODUCTS (NOT APPLICABLE)

## PART 3 EXECUTION

## 3.1 CUTTING AND GRINDING OF SANDSTONE

## \*1

Sandstone shall require cutting and grinding smooth to the configurations shown on the drawings, for use as stone bollards, and a stone benches. **For the Visitor Overlook** bollards, provisions for conduit, recessed walk lights and audio fixtures shall made based upon approved shopdrawings (see section 16800 AUDIO SYSTEM and section 16528 EXTERIOR LIGHTING, for requirements). Cutting and grinding smooth process shall be performed in a factory.\*1

## 3.2 INSTALLATION

## \*1

Sandstone bollards **for the Visitor Overlook** shall be set on stainless steel dowels and setting pads in a full bed of non-shrink grout. Coordinate audio and electrical conduit connections as required. **Other bollards shall be installed as indicated.** Stone benches shall be placed on setting pads and concrete foundation as indicated on the drawings.\*1

## 3.3 CLEAN-UP

Upon completion of the work, portions of structure to remain and adjacent areas and structures shall be cleaned of dust, dirt, and debris caused by salvage and demolition operations. Debris and rubbish shall be removed and transported in a manner that prevents spillage on streets or adjacent areas. Local regulations regarding hauling and disposal shall apply. The Contractor shall comply with the waste disposal requirements outlined in Section 01410, ENVIRONMENT PROTECTION.

-- End of Section --

SECTION TABLE OF CONTENTS

DIVISION 02 - SITE WORK

SECTION 02822

ORNAMENTAL PICKET FENCES AND GATES

**12/01**

PART 1 GENERAL

1.1 SUBMITTALS

1.1.1 WARRANTY

1.4 MEASUREMENT AND PAYMENT

PART 2 PRODUCTS

2.1 MANUFACTURER

2.2 ORNAMENTAL PICKET FENCE

2.3 ACCESSORIES

2.3.1 ORNAMENTAL PICKET SWING GATES

2.3.1.1 PICKET CANTILEVER SLIDE GATE

PART 3 EXECUTION

3.1 INSTALLATION

3.2 CLEANUP

-- End of Section Table of Contents --



## SECTION 02822

## ORNAMENTAL PICKET FENCES AND GATES

12/01

## PART 1 GENERAL

\*1

**See section 11150, Cantilever Slide Gate Operator System, for gate operators and electrical requirements.**

\*1

## 1.1 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01335 SUBMITTAL PROCEDURES:

## SD-01 Data

Product Data; FIO

Manufacturer's catalogue cuts indicating material compliance and specified options.

## SD-04 Drawings

Shop Drawings; GA, ED.

Layout of fences and gates with dimensions, details and finishes of component accessories and post foundations.

## SD-14 Samples

Color Samples; GA, ED

Color selections for polyester finishes. Provide samples of materials, (e.g. finials, caps, and accessories).

## 1.1.1 WARRANTY

Provide manufacturer's standard limited warranty that its ornamental fence system is free from defects in material and workmanship including cracking, peeling, blistering and corroding for a period of 15 years from the date of purchase. Provide manufacturer's standard limited warranty covering cantilever slide gate and truck assembly against failure resulting from normal use for period of 5 years from date of purchase. Failure is defined as any defect in manufacturing that prevents the gate from operating in a

normal manner.

\*1

#### 1.4 MEASUREMENT AND PAYMENT

The measurement and payment for the ornamental picket fencing and gates shall be lump sum. Payment shall include the cost of obtaining all materials, labor, and equipment required for placement of the system including foundations.

\*1

## PART 2 PRODUCTS

### 2.1 MANUFACTURER

Products shall be from qualified manufacturers having a minimum of five years experience manufacturing ornamental picket fencing and gates. Ornamental picket fencing, gates, including accessories, fittings, and fastenings, shall be from the same manufacturer. Style for the 72' tall perimeter fences and gates shall be ESTATE B. Style for the 42" tall viewing area fence shall be IMPERIAL B. Both to be manufactured by Monumental Iron Works, 1704 Trimble Road, Edgewood, Maryland 21040. (phone 410-676-2744 - fax 410-676-7098), or approved equal.

### 2.2 ORNAMENTAL PICKET FENCE

A. Pickets: Galvanized square steel tubular members manufactured per ASTM A-787, having a 45,000 psi yield strength and G90 zinc coating, 0.90 oz/ft<sup>2</sup>. Minimum size pickets 1 inch. Space pickets 3-15/16" maximum face to face. Attach each picket to each rail with 1/4" industrial drive rivets. Size #4. Minimum gauge wall thickness 16 gauge.

B. Rails: 1-1/2" x 1-3/8" x 1-1/2", 11 gauge thick galvanized steel "U" channel per ASTM A-653, having a 50,000 psi yield strength and G90 zinc coating, 0.90 oz/ft<sup>2</sup>. Punch rails to receive pickets and rivets and attach rails to rail brackets with 2 each, 1/4" industrial drive rivets.

C. Posts: Galvanized square steel tubular members manufactured per ASTM A-787 having a 45,000 psi yield strength and G90 zinc coating, 0.90 oz/ft<sup>2</sup>. Zinc coating is (inside and outside), (Posts zinc coated outside and painted inside, is unacceptable). Minimum post size 2 1/2 inches, having 14 gauge wall thickness weighing 2.733 lb/ft.

D. Accessories: Assembled panels with ornamental accessories attached using industrial drive rivets to prevent removal and vandalism.

E. Finish: All pickets, channels, posts, fittings and accessories shall be polyester coated individually after drilling and layout, to ensure maximum corrosion protection. (Coating of assembled sections is unacceptable). All components are given a 4 stage "Power Wash" pre-treatment process that cleans and prepares the galvanized surface to assure complete adhesion of the finish coat. All metal is then given a polyester resin based power coating applied by the electrostatic spray

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

process, to a thickness 2.5 mils. The finish is then baked in a 4500F (metal temperature) oven for 20 minutes. Color shall be Black.

## 2.3 ACCESSORIES

A. Rail Attachment Brackets - die cast of zinc (ZAMAK #3 Alloy) per ASTM B86-83Z 33521. Ball and socket design capable of 30° swivel (up/down - left/right). Bracket to fully encapsulate rail end for complete security. (no substitution)

B. Industrial Drive Rivets: Of sufficient length to attach items in a secure nonrattling position. Rivet to have a minimum of 1100 lbs. holding power and a shear strength of 1500 lbs.

C. Ornamental Picket Fence Accessories: Provide indicated items required to complete fence system. Galvanize each ferrous metal item in accordance with ASTM B695 and finish to match framing.

D. Post Caps: Formed steel, cast of malleable iron or aluminum alloy, weathertight closure cap. Provide one flat style post cap for each post.

E. Rings: Cast aluminum. Attach ring to top rail by inserting mounting blocks into top rail and riveting through side of rail using 1/4" (6 mm) industrial drive rivet. Hold bottom of ring in place by dowel that protrudes from ring through predrilled hole in bottom rail.

F. Picket Tops shall be Pressed steel point style.

## 2.3.1 ORNAMENTAL PICKET SWING GATES

A. Gate Frames: Fabricate ornamental picket swing gate using galvanized steel members, ASTM A78, structural quality steel, 45,000 psi tensile strength, with galvanized G90 coating. Frame members welded using stainless steel welded to form rigid one-piece unit. (no substitution) Minimum size vertical uprights, 2" square 13 gauge wall thickness.

B. Ornamental Picket Infill: "U" channel rails, formed from hot rolled, structural steel, 1-3/8" wide x 1-1/2" deep, 11 gauge wall thickness. Punch rails to receive pickets, and weld inside gate frame. Pickets, galvanized steel, 1" square tube of gauge, spacing, and with accessories to match fence. Attach pickets to "U" rails by 1/4" industrial drive rivets, size #4.

C. Bracing: Provide diagonal adjustable length truss rods on gates to prevent sag.

D. Hardware Materials: Galvanized steel or malleable iron shapes to suit gate size.

E. Hinges: Structurally capable of supporting gate leaf and allow opening and closing without binding. Non-lift-off type hinge design shall permit gate to swing 180° (3.14 rad).

F. Latch: Capable of retaining gate in closed position and have

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

provision for padlock.

G. Keeper: Provide keeper for each gate leaf over 5' (1500 mm) wide. Gate keeper shall consist of mechanical device for securing free end of gate when in full open position.

H. Double Gates: Provide drop rod to hold inactive leaf. Provide gate stop pipe to engage center drop rod. Provide locking device and padlock eyes as an integral part of latch, requiring one padlock for locking both gate leaves.

I. Gate Posts: Square members, ASTM A787, structural quality steel 45,000 psi tensile strength, with galvanized G90 coating; size as indicated below:

Gate Leaf Single Width	Post Size (square)	Weight
3 ft to 4 ft	3"	4.286lb/ft
4 ft to 8 ft	4"	5.770 lb/ft

J. Polyester Powder Coat Finish: After components have been galvanized to provide maximum corrosion resistance, pretreat, clean, and prepare galvanized surface to assure complete adhesion of finish coat. Apply 2.5 mil thickness of polyester resin based powder coating by electrostatic spray process. Bake finish for 20 minutes at 450° F (232° C), metal temperature. Color shall be Black.

#### 2.3.1.1 PICKET CANTILEVER SLIDE GATE

A. Gate frames: Fabricate cantilever slide gate top frame using (2) 2" ASTM B221, alloy and temper 6063-T6, weighing 1.88 lb./ft. Weld members together forming rigid one-piece frame integral with top track.(no substitution) Provide 2 truck assemblies for each gate leaf. Bottom rail 2" x 4" aluminum member weighting 1.71 lb./ft. Gates over 27' in single opening shall be shipped in 2 parts and field spliced with special attachments provided by the manufacturer.

For gates over 15'-0" Opening: Internal uprights: 1" x 2" aluminum members welded in gate frames at maximum 6'-2" face to face, subdividing frame into panels. Gates under 15'-0" will have two equal panels.

Gate Leaf Sizes	Cantilever Support (overhang)
6 ft to 10 ft	6'-6"
11 ft to 14 ft	7'-6"
15 ft to 22 ft	10'-0"
23 ft to 24ft	12'-0"

For gate leaf sizes 25' to 32', weld 2 top track/rails together forming a

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

dual enclosed track. Provide 2 truck assemblies for each track for each gate leaf, total 4 truck assemblies. Bottom rail shall consist of 2" x 4" aluminum member weighing 1.71 lb./ft.

SINGLE GATE LEAF 25' TO 32' OR BI-PARTING DOUBLE 50' TO 64'.

Gate Leaf Sizes	Cantilever Support (overhang)
25 ft to 30 ft	12'-0"
31 ft to 32 ft	13'-6"

For gate leaf sizes 33' to 40', fabricate 24" wide rigid box frame truss. Truss shall consist of dual side frames, constructed similar to standard single leaf gates, separated by square cross member and diagonal truss rod bridging. Dual side frames each contain top track/rail to provide support for truss from both sides. Provide 4 trucks for each track total 8 for each gate leaf. Weld steel plate between top of support posts to maintain truck assemblies in alignment with tracks.

Gate Leaf Sizes	Cantilever Support (overhang)
33 ft to 35 ft	13'-6"
36 ft to 40 ft	16'-0"

Gate Leaf Sizes	Cantilever Support (overhang)
41 ft to 50 ft	Custom engineered by manufacturer

B. Ornamental picket Infill: "U" channel rails formed aluminum, 1-3/8" wide x 1-1/2" deep, 11 gauge wall thickness. Punch rails to receive pickets, and welded inside gate frame. Pickets, galvanized steel, 1" square tube of gauge, spacing, and with accessories to match fence. Attach pickets to "U" rails by 1/4" industrial drive rivets # MIW 381080691.

C. Bracing: Provide diagonal adjustable length truss rods, of 3/8" galvanized steel, in each panel of gate frames.

D. Top track/rail: Enclosed, combination one-piece track and rail, aluminum extrusion with weight of 3.72 lb./ft. Track to withstand reaction load of 2,000 lb.

E. Truck assembly: Swivel type, zinc die cast, with 4 sealed lubricant ballbearing rollers 2" in diameter by 9/16" in width, and 2 side rolling wheels to ensure truck alignment in track. (no substitution) Mount trucks on post brackets using 7/8" diameter ball bolts with 1/2" shank. Design truck assembly to withstand same reaction load as track.

F. Gate hangers, latches, brackets, guide assemblies, and stops: Malleable iron or steel, galvanized after fabrication. Provide positive latch with provisions for padlocking.

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

G. Bottom guide wheel assemblies: Each assembly shall consist of two 3" diameter rubber wheels, straddling bottom horizontal gate rail, allowing adjustment to maintain gate frame plumb and in proper alignment. Attach one assembly to each guide post.

H. Gates posts: Galvanized steel 4" square, weighing 9.59 lb./ft. Provide 1 latch post and 2 support posts for single slide gates and 4 support posts for double slide gates.

I. Accessories: Preassemble panels with ornamental accessories attached with industrial drive rivets to prevent removal and vandalism.

J. Finish: After components have been galvanized (inside and out) to provide maximum corrosion resistance, clean and pretreat with phosphate to form amorphous structure on galvanized surface for superior powder coating adhesion. Give phosphate coated surface a thorough water rinse to prepare surface for seal rinse. Seal rinse with non-chromated solution to improve corrosion resistance and adhesion of finish coat. Bake metal dry, prior to application of powder coating. Apply 2.5 mil thickness of polyester resin based powder coating by electrostatic spray process. Bake finish for 20 minutes at 450°F., metal temperature. Color shall be Black.

K. Setting Material shall be Concrete: Minimum 28 day compressive strength of 3,000 psi.

## PART 3 EXECUTION

## 3.1 INSTALLATION

A. Install fence and gates in accordance with manufacturer's instructions.

B. Space posts uniformly at 7'8-3/4" maximum face to face unless otherwise indicated.

C. Concrete Set Posts: Core drill holes in concrete, size of hole to be slightly larger than post as recommended by manufacturer. Drill holes in firm, undisturbed or compacted soil, size of holes shall have diameter 4 times greater than nominal outside dimension of post, and depths approximately 6" deeper than post bottom. Excavate deeper as required for adequate support in soft and loose soils, and for posts with heavy lateral loads. Set post bottom 36" below surface when in firm, undisturbed soil. Place concrete around post in a continuous pour. Trowel finish around posts and slope to direct water away from posts. Posts set in cored concrete slabs shall be set with nonshrink grout.

D. Gate Posts and Hardware: Set keepers, stops, sleeves and other accessories into concrete.

E. Surface mount (wall mount) posts with mounting plates where indicated. Fasten with lag bolts and shields.

F. Check each post for vertical and top alignment, and maintain in position during placement and finishing operation.

McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

G. Align fence panels between posts. Firmly attach rail brackets to posts with 1/4" bolt and lock nut, ensuring panels and posts remain plumb.

H. Install post caps and other accessories to complete fence.

3.2 CLEANUP

Clean up debris and unused material, and remove from site.

-- End of Section --

SECTION TABLE OF CONTENTS

DIVISION 05 - METALS

SECTION 05093

WELDING PRESSURE PIPING

09/98

PART 1 GENERAL

- 1.1 REFERENCES
- 1.2 PAYMENT
- 1.3 DEFINITIONS
- 1.4 GENERAL REQUIREMENTS
- 1.5 Performance
- 1.6 SUBMITTALS
- 1.7 QUALIFICATIONS
  - 1.7.1 Welding Procedures Qualification
  - 1.7.2 Welder and Welding Operator Performance
    - 1.7.2.1 Certification
    - 1.7.2.2 Identification
    - 1.7.2.3 Renewal of Qualification
  - 1.7.3 Inspection and NDE Personnel
    - 1.7.3.1 Inspector Certification
    - 1.7.3.2 NDE Personnel
- 1.8 DELIVERY, STORAGE, AND HANDLING
  - 1.8.1 Material Control
    - 1.8.1.1 Damaged Containers
    - 1.8.1.2 Partial Issues
  - 1.8.2 Damaged Materials
- 1.9 SYMBOLS
- 1.10 SAFETY

PART 2 PRODUCTS

- 2.1 WELDING MATERIALS

PART 3 EXECUTION

- 3.1 WELDING OPERATIONS
  - 3.1.1 Base Metal Preparation
  - 3.1.2 Weld Joint Fit-Up
  - 3.1.3 Preheat and Interpass Temperatures
  - 3.1.4 Production Welding Instructions
  - 3.1.5 Postweld Heat Treatment
- 3.2 EXAMINATIONS, INSPECTIONS, AND TESTS
  - 3.2.1 Random NDE Testing
  - 3.2.2 Visual Inspection
  - 3.2.3 NDE Testing



McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

- 3.2.4 Inspection and Tests by the Government
- 3.3 ACCEPTANCE STANDARDS
  - 3.3.1 Visual
  - 3.3.2 Magnetic Particle Examination
  - 3.3.3 Liquid Penetrant Examination
  - 3.3.4 Radiography
  - 3.3.5 Ultrasonic Examination
- 3.4 CORRECTIONS AND REPAIRS

-- End of Section Table of Contents --

## SECTION 05093

## WELDING PRESSURE PIPING

09/98

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

## AMERICAN SOCIETY FOR NONDESTRUCTIVE TESTING (ASNT)

ASNT RP SNT-TC-1A	(1996) Recommended Practice SNT-TC-1A
ASNT Q+A Bk A	(1996) Question and Answer Book A: Radiographic Test Method; Levels I, II, III (Supplement to Recommended Practice SNT-TC-1A)
ASNT RP SNT-TC-1A Bk B	(1994) Question and Answers Levels I, II, and III Magnetic Particle Method Book B (Supplement to RP SNT-TC-1A)
ASNT Q+A Bk C	(1994) Question and Answer Book C: Ultrasonic Testing Method; Levels I, II, III (Supplement to RP SNT-TC-1A)
ASNT Q+A Bk D	(1996) Question and Answer Book D: Liquid Penetrant Testing Method; Levels I, II, III (Supplement to RP SNT-TC-1A)

## ASME INTERNATIONAL (ASME)

ASME B31.1	(1998) Power Piping
ASME B31.3	(1999) Process Piping
ASME B31.5	(1992; B31.5a) Refrigeration Piping
ASME BPV I	(1998) Boiler and Pressure Vessel Code; Section I, Power Boilers
ASME BPV II Pt C	(1998) Boiler and Pressure Vessel Code; Section II, Materials, Part C - Specifications for Welding Rods, Electrodes and Filler Metals
ASME BPV V	(1998) Boiler and Pressure Vessel Code;

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

## Section V, Nondestructive Examination

ASME BPV IX (1998) Boiler and Pressure Vessel Code;  
Section IX, Welding and Brazing  
Qualifications

## AMERICAN WELDING SOCIETY (AWS)

AWS A2.4 (1998) Standard Symbols for Welding,  
Brazing and Nondestructive Examination

AWS A3.0 (1994) Standard Welding Terms and  
Definitions

AWS B2.1 (1998) Welding Procedure and Performance  
Qualification

AWS QC1 (1996) AWS Certification of Welding  
Inspectors

AWS Z49.1 (1999) Safety in Welding and Cutting and  
Allied Processes

## 1.2 PAYMENT

**\*1 No additional payment shall be made for the work specified herein.  
Payment shall be incidental to work covered in bid items Hydraulic Power  
System, Raw Water System, Compressed Air System and Control Buildings. \*1**

## 1.3 DEFINITIONS

Definitions shall be in accordance with AWS A3.0.

## 1.4 GENERAL REQUIREMENTS

This section covers the welding of pressure piping systems including hydraulic lines, potable water, low pressure sewage, raw water, compressed air, refrigerant, fuel oil, and generator coolant. Deviations from applicable codes, approved procedures, and approved detail drawings will not be permitted without prior written approval. Materials or components with welds made offsite will not be accepted if the welding does not conform to the requirements of this specification, unless otherwise specified. Procedures shall be developed by the Contractor for welding all metals included in the work. Welding shall not be started until welding procedures, welders, and welding operators have been qualified. Qualification testing shall be performed by an approved testing laboratory, or by the Contractor if approved by the Contracting Officer. Costs of such testing shall be borne by the Contractor. The Contracting Officer shall be notified at least 24 hours in advance of the time and place of the tests. When practicable, the qualification tests shall be performed at or near the worksite. The Contractor shall maintain current records of the test results obtained in the welding procedure, welding operator, welder performance qualifications, and nondestructive examination (NDE) procedures readily available at the site for examination by the Contracting Officer.

The procedures for making transition welds between different materials or between plates or pipes of different wall thicknesses shall be qualified. ASME B31.1, ASME B31.3, ASME B31.5, requirements for branch connections may be used in lieu of detailed designs. Unless otherwise specified, the choice of welding process shall be the responsibility of the Contractor.

#### 1.5 Performance

The Contractor shall be responsible for the quality of all joint preparation, welding, and examination. All materials used in the welding operations shall be clearly identified and recorded. The inspection and testing defined in this specification are minimum requirements. Additional inspection and testing shall be the responsibility of the Contractor when he deems it necessary to achieve the quality required.

#### 1.6 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01335 SUBMITTAL PROCEDURES:

##### SD-01 Data

Qualifications; GA, RE.

Welding procedure qualification.

##### SD-04 Drawings

Pressure Piping; GA, RE.

Detail drawings showing location, length, and type of welds; and indicating postweld heat treatment and NDE as required.

##### SD-13 Certificates

Qualifications; GA, RE.

Welder and welding operator performance qualification certificates. Welding inspectors and NDE personnel certificates. Qualifications of testing laboratory or the Contractor's quality assurance organization.

##### SD-18 Records

Welding Operations; GA, RE.

Detailed procedures which define methods of compliance to contract drawings and specifications. Inspection and material procurement records. System and material testing and certification records. Written records and drawings indicating location of welds made by each welder or welding operator.

#### 1.7 QUALIFICATIONS

Welding procedures, welders, and welding operators previously qualified by test may be accepted for the work without requalification, provided that all of the following conditions are fulfilled:

- a. Copies of the welding procedures, the procedure qualification test records, and the welder and welding operator performance qualification test records are submitted and approved in accordance with paragraph SUBMITTALS.
- b. Testing was performed by an approved testing laboratory or technical consultant or by the Contractor's approved quality assurance organization.
- c. The welding procedures, welders, and welding operators were qualified in accordance with ASME BPV IX, or AWS B2.1, AR-2 level; and base materials, filler materials, electrodes, equipment, and processes conformed to the applicable requirements of this specification.
- d. The requirements of paragraph "Renewal of Qualification" below are met and records showing name of employer and period of employment using the process for which qualified are submitted as evidence of conformance.

#### 1.7.1 Welding Procedures Qualification

The Contractor shall record in detail and shall qualify the Welding Procedure Specifications for every proposed welding procedure. Qualification for each welding procedure shall conform to the requirements of ASME B31.1, ASME B31.3, ASME B31.5, and to this specification. The welding procedures shall specify end preparation for butt welds including cleaning, alignment, and root openings. Preheat, interpass temperature control, and postheat treatment of welds shall be as required by approved welding procedures, unless otherwise indicated or specified. The type of backing rings or consumable inserts, if used, shall be described and if they are to be removed, the removal process shall be described. Copies of the welding procedure specifications and procedure qualification test results for each type of welding required shall be submitted in accordance with paragraph SUBMITTALS. Approval of any procedure does not relieve the Contractor of the sole responsibility for producing acceptable welds. Welding procedures shall be identified individually and shall be referenced on the detail drawings or keyed to the contract drawings.

#### 1.7.2 Welder and Welding Operator Performance

Each welder and welding operator assigned to work shall be qualified in accordance with ASME B31.1, ASME B31.3, ASME B31.5, .

##### 1.7.2.1 Certification

Before assigning welders or welding operators to the work, the Contractor shall provide the Contracting Officer with their names together with certification that each individual is performance-qualified as specified.

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

The certification shall state the type of welding and positions for which each is qualified, the code and procedure under which each is qualified, date qualified, and the firm and individual certifying the qualification tests.

## 1.7.2.2 Identification

Each particular weld shall be identified with the personal number, letter, or symbol assigned to each welder or welding operator. To identify welds, written records indicating the location of welds made by each welder or welding operator shall be submitted, and each welder or welding operator shall apply the personal mark adjacent to the welds using a rubber stamp or felt-tipped marker with permanent, weatherproof ink or other methods approved by the Contracting Officer that do not deform the metal. For seam welds, identification marks shall be placed adjacent to the welds at 3 foot intervals. Identification by die stamps or electric etchers will not be allowed.

## 1.7.2.3 Renewal of Qualification

Requalification of a welder or welding operator shall be required under any of the following conditions:

- a. When a welder or welding operator has not used the specific welding process for a period of 3 months; the period may be extended to 6 months if the welder or welding operator has been employed on some other welding process.
- b. When a welder or welding operator has not welded with any process during a period of 3 months, all the personal qualifications shall be considered expired, including any extended by virtue of a., above.
- c. There is specific reason to question the person's ability to make welds that will meet the requirements of the specifications.
- d. The welder or welding operator was qualified by an employer, other than those firms performing work under this contract, and a qualification test has not been taken within the preceding 12 months.
- e. Renewal of qualification for a specific welding process under conditions a., b., and d., above, needs to be made on only a single test joint or pipe of any thickness, position, or material to reestablish the welder's or welding operator's qualification for any thickness, position, or material covered under previous qualification.

## 1.7.3 Inspection and NDE Personnel

All inspection and NDE personnel shall be qualified in accordance with the following requirements.

## 1.7.3.1 Inspector Certification

Welding inspectors shall be qualified in accordance with AWS QC1.

#### 1.7.3.2 NDE Personnel

NDE personnel shall be certified, and a written procedure for the control and administration of NDE personnel training, examination, and certification shall be established. The procedures shall be based on appropriate specific and general guidelines of training and experience recommended by ASNT RP SNT-TC-1A, ASNT Q+A Bk A ASNT RP SNT-TC-1A Bk B ASNT Q+A Bk C and ASNT Q+A Bk D.

#### 1.8 DELIVERY, STORAGE, AND HANDLING

All filler metals, electrodes, fluxes, and other welding materials shall be delivered to the site in manufacturers' original packages and stored in a dry space until used. Packages shall be properly labeled and designed to give maximum protection from moisture and to insure safe handling.

##### 1.8.1 Material Control

Materials shall be stored in a controlled access and clean, dry area that is weathertight and is maintained at a temperature recommended by the manufacturer. The materials shall not be in contact with the floor and shall be stored on wooden pallets or cribbing.

##### 1.8.1.1 Damaged Containers

Low-hydrogen steel electrodes shall be stored in their sealed shipping container. If the seal is damaged during shipment or storage, and the damage is not immediately detected, the covered electrodes in that container shall be rebaked in accordance with the manufacturer's instructions prior to issuance or shall be discarded. If a container is damaged in storage and the damage is witnessed, the electrodes from that container shall be immediately placed in a storage oven. The storage oven temperature shall be as recommended by the manufacturer or the welding material specification.

##### 1.8.1.2 Partial Issues

When a container of covered electrodes is opened and only a portion of the content is issued, the remaining portion shall, within 1/2 hour, be placed in a storage oven.

##### 1.8.2 Damaged Materials

Materials which are damaged shall be discarded. Covered electrodes which are oil or water-soaked, dirty, or on which the flux has separated from the wire shall be discarded.

#### 1.9 SYMBOLS

Symbols shall be in accordance with AWS A2.4.

## 1.10 SAFETY

Safety precautions shall conform to AWS Z49.1.

## PART 2 PRODUCTS

## 2.1 WELDING MATERIALS

Welding materials shall comply with ASME BPV II Pt C. Welding equipment, electrodes, welding wire, and fluxes shall be capable of producing satisfactory welds when used by a qualified welder or welding operator using qualified welding procedures.

## PART 3 EXECUTION

## 3.1 WELDING OPERATIONS

Welding shall be performed in accordance with qualified procedures using qualified welders and welding operators. Welding shall not be done when the quality of the completed weld could be impaired by the prevailing working or weather conditions. The Contracting Officer shall determine when weather or working conditions are unsuitable for welding. Welding of hangers, supports, and plates to structural members shall conform to Section 05055 WELDING, STRUCTURAL.

## 3.1.1 Base Metal Preparation

Oxy-fuel cutting shall not be used on austenitic stainless steel or nonferrous materials.

## 3.1.2 Weld Joint Fit-Up

Parts that are to be joined by welding shall be fitted, aligned, and retained in position during the welding operation by the use of bars, jacks, clamps, or other mechanical fixtures. Welded temporary attachments shall not be used except when it is impractical to use mechanical fixtures.

When temporary attachments are used, they shall be the same material as the base metal and shall be completely removed by grinding or thermal cutting after the welding operation is completed. If thermal cutting is used, the attachment shall be cut to not less than 1/4 inch from the member and the balance removed by grinding. After the temporary attachment has been removed, the area shall be visually examined.

## 3.1.3 Preheat and Interpass Temperatures

Preheat temperatures shall meet the requirements specified by ASME B31.1, ASME B31.3, ASME B31.5, . However, in no case shall the preheat be below 50 degrees F for ferritic steel or austenitic stainless steel, or 32 degrees F for nonferrous alloys. The maximum interpass temperatures shall not exceed 300 degrees F for austenitic stainless steels, nickel alloys, and copper alloys; and 500 degrees F for carbon steels. Preheat techniques shall be such as to ensure that the full thickness of the weld joint preparation and/or adjacent base material, at least 3 inches in all directions, is at the specified temperature. Preheating by induction or



resistance methods is preferred. When flame heating is used, only a neutral flame shall be employed. Oxy-fuel heating shall not be used on austenitic stainless steel or nickel-alloy materials; however, air-fuel heating is acceptable if controlled to insure that the surface temperature does not exceed 150 degrees F. Interpass temperatures shall be checked on the surface of the component within 1 inch of the weld groove and at the starting location of the next weld pass, and for a distance of about 6 inches ahead of the weld, but not on the area to be welded.

#### 3.1.4 Production Welding Instructions

- a. Welding shall not be done when the ambient temperature is lower than 0 degree F.
- b. Welding is not permitted on surfaces that are wet or covered with ice, when snow or rain is falling on the surfaces to be welded, or during periods of high winds, unless the welders and the work are properly protected.
- c. Gases for purging and shielding shall be welding grade and shall have a dew point of minus 40 degrees F or lower.
- d. Back purges are required for austenitic stainless steels and nonferrous alloys welded from one side and shall be set up such that the flow of gas from the inlet to the outlet orifice passes across the area to be welded. The oxygen content of the gas exiting from the purge vent shall be less than 2 percent prior to welding.
- e. The purge on groove welds shall be maintained for at least three layers or 3/16 inch.
- f. Removable purge dam materials shall be made of expandable or flexible plugs, such as plexiglass, plywood (which shall be dry when used), etc. Wood dams shall be kiln-dried quality. Nonremovable purge dams and purge dam adhesives shall be made of water soluble materials. Purge dams shall not be made of polyvinyl alcohol.
- g. Any welding process which requires the use of external gas shielding shall not be done in a draft or wind unless the weld area is protected by a shelter. This shelter shall be of material and shape appropriate to reduce wind velocity in the vicinity of the weld to a maximum of 5 mph (440 fpm).
- h. Welding of low-alloy and hardenable high-alloy steels may be interrupted provided a minimum of at least 3/8 inch thickness of weld deposit or 25 percent of the weld groove is filled, whichever is greater, and the preheat temperature is maintained during the time that welding is interrupted. If the temperature falls below the minimum preheat temperature before all welding has been completed on a joint or, where required, before post weld heat treatment, a liquid penetrant or magnetic particle examination shall be performed to insure sound deposited metal before

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

reheating. Welding of other materials may be interrupted without restriction provided a visual inspection is performed before welding is resumed.

- i. Tack welds to be incorporated in the final welds shall have their ends tapered by grinding or welding technique. Tack welds that are cracked or defective shall be removed and the groove shall be retacked prior to welding. Temporary tack welds shall be removed, the surface ground smooth, and visually inspected. For low-alloy and hardenable high-alloy steels, the area shall be magnetic particle examination inspected.

- j. When joining ferritic steel pressure piping components to austenitic stainless steel pressure piping components and postweld heat treatment is required, the following requirements apply:

(1) The weld-end preps of ferritic steel components, which are to be welded to austenitic stainless steel, shall be buttered with one of the following weld filler metals and shall conform to the specified requirements:

ASME BPV II Pt C, SFA 5.14, Classification ERNiCr-3.

ASME BPV II Pt C, SFA 5.11, Classification ENiCrFe-2.

(2) The ferritic steel weld-end prep shall be buttered, receive a postweld heat treatment as required by ASME B31.1, ASME B31.3, ASME B31.5, and then be machined with the applicable weld-end preparation. After machining, the buttered layer shall be a minimum of 1/4 inch thick.

(3) Pressure piping transition joints shall be completed using ERNiCr-3 or ENiCrFe-2 weld filler metals. No further postweld heat treatment shall be performed.

- k. When joining ferritic steel pressure piping components to austenitic stainless steel pressure piping components and postweld heat treatment is not required, prepare and weld the joint using either ERNiCr-3 or ENiCrFe-2 filler metals. For service temperatures of 200 degrees F or less, stainless filler metal 309 ASME BPV II Pt C, SFA 5.4 or 5.9 is permissible in lieu of the nickel-based alloys.

- l. Grinding of completed welds is to be performed only to the extent required for NDE, including any inservice examination, and to provide weld reinforcement within the requirements of ASME B31.1, ASME B31.3, ASME B31.5, . If the surface of the weld requires grinding, reducing the weld or base material below the minimum required thickness shall be avoided. Minimum weld external reinforcement shall be flush between external surfaces.

### 3.1.5 Postweld Heat Treatment

Postweld heat treatment shall be performed in accordance with ASME B31.1,

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

ASME B31.3, ASME B31.5, . Temperatures for local postweld heat treatment shall be measured continuously by thermocouples in contact with the weldment.

Postweld heat treatment of low-alloy steels, when required, shall be performed immediately upon completion of welding and prior to the temperature of the weld falling below the preheat temperature. However, postweld heat treatment may be postponed after the completion of the weld if, immediately after the weld is completed, it is maintained at a minimum temperature of 300 degrees F or the preheat temperature, whichever is greater, for 2 hours per inch of weld thickness.

For low-alloy steels, the cooling rates shall be such that temper embrittlement is avoided.

### 3.2 EXAMINATIONS, INSPECTIONS, AND TESTS

Visual and NDE shall be performed by the Contractor to detect surface and internal discontinuities in completed welds. The services of a qualified commercial inspection or testing laboratory or technical consultant, approved by the Contracting Officer, shall be employed by the Contractor. All tack welds, weld passes, and completed welds shall be visually inspected. In addition, liquid penetrant examination shall be performed on root passes. Radiographic Liquid penetrant Magnetic particle or Ultrasonic examination shall be required as indicated in TABLE I. When inspection and testing indicates defects in a weld joint, the weld shall be repaired by a qualified welder in accordance with paragraph CORRECTIONS AND REPAIRS.

TABLE I. MANDATORY MINIMUM NONDESTRUCTIVE EXAMINATIONS

Type Weld	Piping Service Conditions and Nondestructive Test		
	Temperatures over 750 degrees F and at all pressures.	Temperatures between 350 degrees F and 750 degrees F inclusive and at pressures above 1,025 psig.	All others.
Butt Welds (Girth and Longitudinal)	RT for NPS over 2 inch MT or PT for NPS 2 inches and less.	RT for over 2 inch NPS with thickness over 3/4 inch. Visual for all sizes with thickness 3/4 inch or less.	Visual for all sizes and thicknesses.
Welded Branch Connections (Size indicated is branch size)	RT for NPS over 4 inch MT or PT for NPS 4 inches and less.	RT for branch over 4 inch NPS and thickness of branch over 3/4	Visual for all sizes and thicknesses.

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

TABLE I. MANDATORY MINIMUM NONDESTRUCTIVE EXAMINATIONS

Type Weld (See Note 7)	Piping Service Conditions and Nondestructive Test		
		inch. Visual for all sizes with branch thickness 3/4 inch or less.	
Fillet, Socket Attachment and Seal Welds	PT or MT for all sizes and thicknesses.	Visual for all sizes and thicknesses.	Visual for all sizes and thicknesses.

## NOTES TO TABLE I

- (1) All welds must be given a visual examination in addition to type of specific nondestructive examination specified.
- (2) NPS - nominal pipe size.
- (3) RT - Radiographic examination; MT - magnetic particle examination; PT - liquid penetrant examination.
- (4) RT of branch welds shall be performed before any nonintegral reinforcing material is applied.
- (5) The thickness of butt welds is defined as the thicker of the two abutting ends after end preparation.
- (6) Temperatures and pressures shown are design.
- (7) In lieu of radiography of welded branch connections when required above, liquid penetrant or magnetic particle examination is acceptable and, when used, shall be performed at the lesser of one half of the weld thickness or each 1/2 inch of weld thickness and all accessible final weld surfaces.
- (8) For nondestructive examination of the pressure retaining component, refer to the standards listed in applicable code or the manufacturing specifications.
- (9) Fillet welds not exceeding 1/4 inch throat thickness which are used for the permanent attachment of nonpressure retaining parts are exempt from the PT or MT requirements of the above table.

## 3.2.1 Random NDE Testing

When random radiographic liquid penetrant magnetic particle or ultrasonic examination is required, the Contractor shall test a minimum of 10 percent of the total length or number of piping welds. The welds inspected shall be selected randomly, but the selection shall include an examination of welds made by each welding operator or welder. If the random testing

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

reveals that any welds fail to meet minimum quality requirements, an additional 5 percent of the welds in that same group shall be inspected. If all of the additional welds inspected meet the quality requirements, the entire group of welds represented shall be accepted and the defective welds shall be repaired. If any of the additional welds inspected also fail to meet the quality requirements, that entire group of welds shall be rejected. The rejected welds shall be removed and rewelded, or the rejected welds shall be 100 percent inspected and all defective weld areas removed and rewelded.

### 3.2.2 Visual Inspection

Weld joints shall be inspected visually as follows:

- a. Before welding - for compliance with requirements for joint preparation, placement of backing rings or consumable inserts, alignment and fit-up, and cleanliness.
- b. During welding - for cracks and conformance to the qualified welding procedure.
- c. After welding - for cracks, contour and finish, bead reinforcement, undercutting, overlap, and size of fillet welds.

### 3.2.3 NDE Testing

NDE shall be in accordance with written procedures. Procedures for radiographic liquid penetrant magnetic particle or ultrasonic tests and methods shall conform to ASME BPV V. The approved procedure shall be demonstrated to the satisfaction of the Contracting Officer. In addition to the information required in ASME BPV V, the written procedures shall include the timing of the NDE in relation to the welding operations and safety precautions.

### 3.2.4 Inspection and Tests by the Government

The Government will perform inspection and supplemental nondestructive or destructive tests as deemed necessary. The cost of supplemental NDE will be borne by the Government. The correction and repair of defects and the reexamination of weld repairs shall be performed by the Contractor at no additional cost to the Government. Inspection and tests will be performed as required for visual inspection and NDE, except that destructive tests may be required also. When destructive tests are ordered by the Contracting Officer and performed by the Contractor and the specimens or other supplemental examinations indicate that the materials and workmanship do not conform to the contract requirements, the cost of the tests, corrections, and repairs shall be borne by the Contractor. When the specimens or other supplemental examinations of destructive tests indicate that materials or workmanship do conform to the specification requirements, the cost of the tests and repairs will be borne by the Government. When destructive tests are made, repairs shall be made by qualified welders or welding operators using welding procedures which will develop the full strength of the members cut. Welding shall be subject to inspection and tests in the mill, shop, and field. When materials or workmanship do not

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

conform to the specification requirements, the work may be rejected at any time before final acceptance of the system containing the weldment.

### 3.3 ACCEPTANCE STANDARDS

#### 3.3.1 Visual

The following indications are unacceptable:

- a. Cracks.
- b. Undercut on surface which is greater than 1/32 inch deep.
- c. Weld reinforcement greater than 3/16 inch.
- d. Lack of fusion on surface.
- e. Incomplete penetration (applies only when inside surface is readily accessible).
- f. Convexity of fillet weld surface greater than 10 percent of longest leg plus 0.03 inch.
- g. Concavity in groove welds.
- h. Concavity in fillet welds greater than 1/16 inch.
- i. Fillet weld size less than indicated or greater than 1-1/4 times the minimum indicated fillet leg length.

#### 3.3.2 Magnetic Particle Examination

The following relevant indications are unacceptable:

- a. Any cracks and linear indications.
- b. Rounded indications with dimensions greater than 3/16 inch.
- c. Four or more rounded indications in a line separated by 1/16 inch or less edge-to-edge.
- d. Ten or more rounded indications in any 6 square inches of surface with the major dimension of this area not to exceed 6 inches with the area taken in the most unfavorable location relative to the indications being evaluated.

#### 3.3.3 Liquid Penetrant Examination

Indications with major dimensions greater than 1/16 of an inch shall be considered relevant. The following relevant indications are unacceptable:

- a. Any cracks or linear indications.
- b. Rounded indications with dimensions greater than 3/16 inch.

- c. Four or more rounded indications in a line separated by 1/16 inch or less edge-to-edge.
- d. Ten or more rounded indications in any 6 square inches of surface with the major dimension of this area not to exceed 6 inches with the area taken in the most unfavorable location relative to the indications being evaluated.

#### 3.3.4 Radiography

Welds that are shown by radiography to have any of the following discontinuities are unacceptable:

- a. Porosity in excess of that shown as acceptable in ASME BPV I, Appendix A-250.
- b. Any type of crack or zone of incomplete fusion or penetration.
- c. Any other elongated indication which has a length greater than:
  - (1) 1/4 inch for t up to 3/4 inch inclusive, where t is the thickness of the thinner portion of the weld.
  - (2) 1/3 t for t from 3/4 inch to 2-1/4 inch, inclusive.
  - (3) 3/4 inch for t over 2-1/4 inch.
- d. Any group of indications in line that have an aggregate length greater than t in a length of 12t, except where the distance between the successive indications exceeds 6L where L is the longest indication in the group.

Where t pertains to the thickness of the weld being examined; if a weld joins two members having different thickness at the weld, t is the thinner of these two thicknesses.

#### 3.3.5 Ultrasonic Examination

Linear-type discontinuities are unacceptable if the amplitude exceeds the reference level and discontinuities have lengths which exceed the following:

- a. 1/4 inch for t up to 3/4 inch.
- b. 1/3 inch for t from 3/4 to 2-1/4 inch.
- c. 3/4 inch for t over 2-1/4 inch.

Where t is the thickness of the weld being examined; if the weld joins two members having different thicknesses at the weld, t is the thinner of these two thicknesses. Where discontinuities are interpreted to be cracks, lack of fusion, and incomplete penetration, they are unacceptable regardless of length.

## 3.4 CORRECTIONS AND REPAIRS

Defects shall be removed and repaired as specified in ASME B31.1, ASME B31.3, ASME B31.5, unless otherwise specified. Disqualifying defects discovered between weld passes shall be repaired before additional weld material is deposited. Wherever a defect is removed, and repair by welding is not required, the affected area shall be blended into the surrounding surface eliminating sharp notches, crevices, or corners. After defect removal is complete and before rewelding, the area shall be examined by the same test method which first revealed the defect to ensure that the defect has been eliminated. After rewelding, the repaired area shall be reexamined by the same test method originally used for that area. Any indication of a defect shall be regarded as a defect unless reevaluation by NDE or by surface conditioning shows that no disqualifying defects are present. The use of any foreign material to mask, fill in, seal, or disguise welding defects will not be permitted.

-- End of Section --



SECTION TABLE OF CONTENTS

DIVISION 05 - METALS

SECTION 05400

COLD-FORMED STEEL FRAMING

03/99

PART 1 GENERAL

- 1.1 REFERENCES
- 1.2 SUBMITTALS
- 1.3 DELIVERY, HANDLING AND STORAGE \*1
- 1.4 PAYMENT

PART 2 PRODUCTS

- 2.1 STEEL STUDS, TRACKS, BRACING, BRIDGING, AND ACCESSORIES
  - 2.1.1 Truss Components
  - 2.1.2 Truss Materials
- 2.2 MARKINGS
- 2.3 CONNECTIONS
- 2.4 TRUSS FABRICATION

PART 3 EXECUTION

- 3.1 Delivery, Handling and Storage
- 3.2 CONNECTIONS
  - 3.2.1 Welds
  - 3.2.2 Screws
  - 3.2.3 Anchors
- 3.3 INSTALLATION
  - 3.3.1 General Requirements
  - 3.3.2 Joists
  - 3.3.3 Trusses
    - 3.3.3.1 General Requirements
- 3.4 TOLERANCES
- 3.5 \*1 DELETED \*1

-- End of Section Table of Contents --

SECTION 05400  
COLD-FORMED STEEL FRAMING  
**03/99**

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

## AMERICAN IRON AND STEEL INSTITUTE (AISI)

AISI Cold-Formed Spec	(1996) Specification & Commentary for the Design of Cold-Formed Steel Structural Members (Part V of the Cold-Formed Steel Design Manual)
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## AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 123/A 123M	(1997a <sup>1</sup> ) Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A 153/A 153M	(1998) Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A 370	(1997a) Mechanical Testing of Steel Products
ASTM A 653/A 653M	(1999) Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM B 633	(1985; R 1998) Electrodeposited Coatings of Zinc on Iron and Steel
ASTM C 955	(1998) Load-Bearing (Transverse and Axial) Steel Studs, Runners (Tracks), and Bracing or Bridging for Screw Application of Gypsum Panel Products and Metal Plaster Bases
ASTM E 329	(1998) Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction

## AMERICAN WELDING SOCIETY (AWS)

AWS D1.3 (1998) Structural Welding Code - Sheet Steel

SOCIETY OF AUTOMOTIVE ENGINEERS (SAE)

SAE J 78 (1998) Steel Self Drilling Tapping Screws

## 1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01335 SUBMITTAL PROCEDURES:

\*1

### **SD-03 Product Data**

#### **Cold-Formed Steel Truss; G, ED**

- a. Manufacturer's product data and installation instructions for each type of cold-formed steel framing and accessory required.

\*1

#### **SD-04 Drawings**

\*1

#### **Cold-Formed Steel Framing; G, ED**

\*1

\*1

- a. Cross sections, plans, and/or elevations showing component types and locations for each framing application; including shop coatings and material thicknesses for each framing component.

**Shop drawings of individual trusses showing members, type, location, spacing, size, and gauge of members. Indicate supplemental bracing, strapping, splices, bridging, accessories, and details showing connections.**

\*1

- b. Connection details showing fastener type, quantity, location, and other information to assure proper installation.

- c. Drawings depicting panel configuration, dimensions, components, locations, and construction sequence if the Contractor elects to install prefabricated/prefinished frames.

\*1

### **SD-05 Design Data**

#### **Cold-Formed Steel Truss Calculations; G, ED**

- a. Design documents and drawings of detailed roof truss layouts, sealed and signed by a qualified registered professional engineer, verifying trusses ability to meet local codes and design requirements. Include:

- (1). Description of design criteria.
- (2). Engineering analysis depicting member stresses and truss deflection. Provide reactions at interface to walls.
- (3). Truss member sizes and gauges and connections at truss joints and supports.
- (4). Top chord, bottom chord, and web bracing.

\*1

## SD-13 Certificates

## Mill Certificates; FIO

Mill certificates or test reports from independent testing agency, qualified in accordance with ASTM E 329, showing that the steel sheet used in the manufacture of each cold-formed component complies with the minimum yield strengths and uncoated steel thickness specified. Test reports shall be based on the results of three coupon tests in accordance with ASTM A 370.

## Welding Certificates; FIO

Certified copies of welder qualifications test records showing qualification in accordance with AWS D1.3.

## 1.3 DELIVERY, HANDLING AND STORAGE

\*1

A. Materials shall be delivered and handled preventing bending or other damage, and avoiding contact with soil or other contaminating materials. Finish of the framing members shall be maintained at all times, using an approved high zinc dust content, galvanizing repair paint whenever necessary to prevent the formation of rust.

B. Store trusses on blocking, pallets, platforms or other supports off the ground and in an upright position sufficiently braced to avoid damage from excessive bending.

C. Protect trusses and accessories from corrosion, deformation, damage and deterioration when stored at job site. Keep trusses free of dirt and other foreign matter.

\*1

\*1

## 1.4 PAYMENT

No separate payment or direct payment will be made for the work covered under this section. Any such work shall be considered incidental to the applicable bid item to which the work pertains.

\*1

## PART 2 PRODUCTS

## 2.1 STEEL STUDS, TRACKS, BRACING, BRIDGING, AND ACCESSORIES

Framing components shall comply with ASTM C 955 and the following:

- a. Material shall be corrosion-resistant steel complying with ASTM A 653/A 653M, Grade 33 or higher, having a minimum yield of 33,000 psi and a G 60 minimum zinc coating.
- b. Minimum uncoated steel thickness (design thickness times 0.95):
  - (1). Studs and Tracks: 0.0329inch.
  - (2). Bracing and bridging: Thickness as shown on the drawings.
  - (3). Accessories: Standard thickness as provided by the manufacturer.

\*1

- c. Stud and Track web depth: 2-1/2 and 3-5/8 inches.
- d. DELETED
- e. DELETED

## 2.1.1 Truss Components

Provide manufacturer's standard steel truss members, bracing, bridging, blocking, reinforcements, fasteners, and accessories with each type of steel framing required, as recommended by the manufacturer for the applications indicated.

- a. The uplift cladding pressures for the roof are divided into two zones. The maximum uplift pressure of 35 psf occurs in a 60 inch wide strip bounded by all of the eave lines. The other uplift pressure of 22 psf occurs over the remainder of the roof.
- b. The roof and it's components shall achieve a UL 90 rating.

## 2.1.2 Truss Materials

**Materials**

- a. All components: Fabricate components of structural quality steel sheet per ASTM A653 with a minimum yield strength of 33 ksi.
- b. Bracing, bridging, and blocking members: Fabricate components of commercial quality steel sheet per ASTM A653 with a minimum yield strength of 33 ksi.
- c. Provide sizes, shapes, and gauges as required by design, but no less than a design uncoated steel thickness of 18 ga.
- d. Finish: Provide components with protective zinc coating complying with ASTM A653, minimum G 60 coating.

\*1

## 2.2 MARKINGS

Studs and track shall have product markings on the web of the section. The markings shall be repeated throughout the length of the member at a maximum spacing of 4 feet on center and shall be legible and easily read. The product marking shall include the following:

- a. Manufacturer's identification.
- b. Minimum delivered uncoated steel thickness.
- c. Protective coating designator.
- d. Minimum yield strength.

## 2.3 CONNECTIONS

Screws for steel-to-steel connections shall be self-drilling tapping in compliance with SAE J 78 of the type, size, and location as shown on the drawings. Electroplated screws shall have a Type II coating in accordance with ASTM B 633. Screws, bolts, and anchors shall be hot-dipped galvanized in accordance with ASTM A 123/A 123M or ASTM A 153/A 153M as appropriate. Screws bolts, and anchors shall be hot dipped galvanized in accordance with ASTM A 123/A 123M or ASTM A 153/A 153M as appropriate.

\*1

## 2.4 TRUSS FABRICATION

Factory fabricate cold-formed steel trusses plumb, square, true to line, and with connections securely fastened, according to manufacturer's recommendations and the requirements of this section.

- a. Fabricate truss assemblies in jig templates.
- b. Cut truss members by sawing, shearing, or plasma cutting.
- c. Fasten cold-formed steel trusses plumb, square, true to line, and with connections securely fastened, according to manufacturer's recommendations and the requirements of this section.
- d. Locate mechanical fasteners and install according to cold-formed steel truss component manufacturer's instructions with screw penetrating joined members by not less than 3 exposed screw threads.
- e. Care shall be taken during handling, delivery, and erection. Brace, block, or reinforce truss as necessary to minimize member end connection stresses.

\*1

## PART 3 EXECUTION

## 3.1 Delivery, Handling and Storage

- a. Materials shall be delivered and handled in a manner to avoid bending or other damage and to avoid contact with the soil or other contaminating materials.
- b. Finish of the framing members shall be maintained at all times, using an approved high zinc dust content galvanizing repair paint whenever necessary to prevent the formation of rust.

## 3.2 CONNECTIONS

## 3.2.1 Welds

All welding shall be performed in accordance with AWS D1.3, as modified by AISI Cold-Formed Spec. All welders, welding operations, and welding procedures shall be qualified according to AWS D1.3. All welds shall be cleaned and coated with rust inhibitive galvanizing paint.

## 3.2.2 Screws

Screws shall be of the self-drilling self-tapping type, size, and location shown on the drawings. Screw penetration through joined materials shall not be less than three exposed threads. Minimum spacings and edge distances for screws shall be as specified in AISI Cold-Formed Spec. Screws covered by sheathing materials shall have low profile heads.

## 3.2.3 Anchors

Anchors shall be of the type, size, and location shown on the drawings.

## 3.3 INSTALLATION

## 3.3.1 General Requirements

- a. Prefabricated frames shall be square, with components attached to prevent racking during fabrication, transportation, and lifting. Design and construction of frames shall include provisions for lifting.
- b. Cutting of steel framing shall be by saw, shear, or plasma cutting equipment. Oxyacetylene torch cutting is not permitted.
- c. Temporary bracing shall be provided and remain in place until work is permanently stabilized.
- d. Abutting lengths of track shall be butt-welded, spliced, or each length securely anchored to a common structural element. Track shall be securely anchored to the supporting structure as shown on the drawings.
- e. Splicing of framing components, other than track and tension

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

members, is not permitted.

f. Wire tying of framing members is not permitted.

### 3.3.2 Joists

- a. Joists shall be spaced as shown on the drawings.
- b. Uniform and level joist bearing at the foundation wall shall be provided by means of shims and/or shrink grout.
- c. Web stiffeners at support locations and at points of concentrated loads shall be provided as shown on the drawings.
- d. Joists shall align vertically with load bearing studs. Where vertical alignment is not possible, a continuous load distribution member at the top track shall be provided as shown on the drawings.
- e. Bridging, of the type and spacing shown on the drawings, shall be installed prior to loading.
- f. Additional framing around openings shall be provided as shown on the drawings when the width of the opening exceeds the typical joist spacing.

\*1

### 3.3.3 Trusses

#### 3.3.3.1 General Requirements:

##### A. General:

- 1. Erection of trusses, including proper handling, safety precautions, temporary bracing and other safeguards or procedures are the responsibility of the Contractor and Contractor's Installer.
- 2. Exercise care and provide erection bracing required to prevent toppling or dominoing of trusses during erection.

- B. Erect trusses with plane of truss webs vertical and parallel to each other, accurately located at the spacings shown on the drawings.
- C. Provide proper lifting equipment suited to sizes and types of trusses required, applied at lift points recommended by truss fabricator. Exercise care to avoid damage to truss members during erection and to keep horizontal bending of the trusses to a minimum.
- D. Trusses shall be bridged and braced before the installation of collateral materials.
- E. Anchor trusses securely at bearing points.



**F. Temporary bracing shall be provided and remain in place until work is permanently stabilized.**

**\*1**

### 3.4 TOLERANCES

Vertical alignment (plumbness) of studs shall be within 1/960th of the span. Horizontal alignment (levelness) of walls shall be within 1/960th of their respective lengths. Spacing of studs shall not be more than plus 1/8 inch from the designed spacing providing the the cumulative error does not exceed the requirements of the finishing material. The serviceability deflection limits for trusses and rafters shall be L/240 total load; L/360 live load and L/180 total load; L/240 live load respectively.

### 3.5 \*1 DELETED \*1

-- End of Section --

SECTION TABLE OF CONTENTS

DIVISION 13 - SPECIAL CONSTRUCTION

SECTION 13202

FUEL STORAGE SYSTEMS

05/97

PART 1 GENERAL

- 1.1 REFERENCES
- 1.2 SYSTEM DESCRIPTION
- 1.3 PAYMENT
- 1.4 SUBMITTALS
- 1.5 QUALIFICATIONS
  - 1.5.1 Experience
  - 1.5.2 Welding
- 1.6 Registration
- 1.7 DELIVERY, STORAGE, AND HANDLING
- 1.8 PROJECT/SITE CONDITIONS
  - 1.8.1 Verification of Dimensions
  - 1.8.2 Fuel Supply
  - 1.8.3 Safety Requirements

PART 2 PRODUCTS

- 2.1 STANDARD PRODUCTS
- 2.2 NAMEPLATES
- 2.3 ELECTRICAL WORK
- 2.4 MATERIALS IN CONTACT WITH FUEL
- 2.5 ABOVEGROUND STORAGE TANK
  - 2.5.1 1000 Gallon Fuel Storage Tank
  - 2.5.2 Tank Exterior Protective Coating
  - 2.5.3 Tank Interior Protective Coating
  - 2.5.4 Tank Piping Penetrations
  - 2.5.5 Tank Cleanout and Gauge Connection
  - 2.5.6 Tank Atmospheric Venting
  - 2.5.7 Tank Emergency Venting
  - 2.5.8 Tank Alarm System
- 2.6 TANK GAUGES
  - 2.6.1 Stick Gauge
  - 2.6.2 Tank Calibration Charts
  - 2.6.3 Analog Tank Gauge
- 2.7 ADAPTERS AND COUPLERS
  - 2.7.1 Tight-Fit Fill Adapter
  - 2.7.2 Dry-Break Coupler
- 2.8 SUPPLEMENTAL COMPONENTS
  - 2.8.1 Electrically Isolating Flanges
  - 2.8.2 Electrically Isolating Union

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

- 2.8.3 Concrete Anchor Bolts
- 2.8.4 Bolts
- 2.8.5 Nuts
- 2.8.6 Washers
- 2.8.7 Exterior Coating of Miscellaneous Items
- 2.9 MONITORING SYSTEM
  - 2.9.1 Aboveground Storage Tanks
  - 2.9.2 Electronic Monitoring Panel
- 2.10 PIPING COMPONENTS
  - 2.10.1 Product Piping
  - 2.10.2 Vent Piping
  - 2.10.3 Stainless Steel Pipe
    - 2.10.3.1 Connections
    - 2.10.3.2 Welding Process and Electrodes
  - 2.10.4 Valves
    - 2.10.4.1 Gate
    - 2.10.4.2 Swing Type Check
    - 2.10.4.3 Wafer Type Check
    - 2.10.4.4 Ball
    - 2.10.4.5 Plug
    - 2.10.4.6 Globe
    - 2.10.4.7 Pressure/Vacuum Vent Relief
  - 2.10.5 Accessories
    - 2.10.5.1 Foot Valve
    - 2.10.5.2 Flanges
    - 2.10.5.3 Flange Gaskets
    - 2.10.5.4 Steel Coupling
    - 2.10.5.5 Welded Nipple
    - 2.10.5.6 Threaded Union
    - 2.10.5.7 Joint Compound
    - 2.10.5.8 Flexible Connector
    - 2.10.5.9 Strainer
    - 2.10.5.10 Pipe Hangers and Supports
    - 2.10.5.11 Pressure Gauge

## PART 3 EXECUTION

- 3.1 INSTALLATION
  - 3.1.1 Equipment
  - 3.1.2 Piping
    - 3.1.2.1 Pipe Hangers and Supports
    - 3.1.2.2 Pipe Sleeve
  - 3.1.3 Field Painting
  - 3.1.4 Framed Instructions
- 3.2 TESTS
  - 3.2.1 Aboveground Storage Tank Tightness Tests
  - 3.2.2 Manufacturer's Tank Tests
  - 3.2.3 Piping Pneumatic and Hydrostatic Tests
    - 3.2.3.1 Pneumatic Procedures for Product and Vent Piping
    - 3.2.3.2 Hydrostatic Procedures for Product Piping
  - 3.2.4 System Performance Tests
  - 3.2.5 High and Low Liquid Level Alarm Test
- 3.3 FLUSHING, CLEANING AND ADJUSTING
  - 3.3.1 Preparations for Flushing

McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

- 3.3.1.1 Initial System Cleaning
- 3.3.1.2 Protection of Equipment
- 3.3.2 System Flushing
  - 3.3.2.1 Initial Fuel Supply
  - 3.3.2.2 Disposal of Initial Fuel Supply
- 3.3.3 Cleaning Equipment
- 3.3.4 Initial System Adjustments
- 3.4 DEMONSTRATIONS

-- End of Section Table of Contents --

## SECTION 13202

## FUEL STORAGE SYSTEMS

05/97

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

## AMERICAN PETROLEUM INSTITUTE (API)

API RP 1110	(1997) Pressure Testing of Liquid Petroleum Pipelines
API RP 1631	(1997) Interior Lining of Underground Storage Tanks
API Spec 5L	(1995; Errata Dec 1997) Line Pipe
API Spec 6D	(1994; Supple 1 June 1996; Supple 2 Dec 1997) Pipeline Valves (Gate, Plug, Ball, and Check Valves)
API Spec 6FA	(1999) Fire Test for Valves
API Std 594	(1997) Check Valves: Wafer, Wafer-Lug and Double Flanged Type
API Std 607	(1993) Fire Test for Soft-Seated Quarter-Turn Valves
API Std 650	1998 Welded Steel Tanks for Oil storage
API Std 2000	1998 Venting Atmospheric and Low-Pressure Storage Tanks: Nonrefrigerated and Refrigerated

## AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 36/A 36M	(1997ael) Carbon Structural Steel
ASTM A 167	(1999) Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

ASTM A 181/A 181M	(1995b) Carbon Steel Forgings, for General-Purpose Piping
ASTM A 182/A 182M	(1998a) Forged or Rolled Alloy-Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High-Temperature Service
ASTM A 193/A 193M	(1999) Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service
ASTM A 194/A 194M	(1998b) Carbon and Alloy Steel Nuts for Bolts for High-Pressure and High-Temperature Service
ASTM A 307	(1997) Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength
ASTM A 312/A 312M	(1999) Seamless and Welded Austenitic Stainless Steel Pipes
ASTM A 358/A 358M	(1998) Electric-Fusion-Welded Austenitic Chromium-Nickel Alloy Steel Pipe for High-Temperature Service
ASTM A 403/A 403M	(1999) Wrought Austenitic Stainless Steel Piping Fittings
ASTM A 733	(1999) Welded and Seamless Carbon Steel and Austenitic Stainless Steel Pipe Nipples
ASTM A 743/A 743M	(1998a <sup>el</sup> ) Castings, Iron-Chromium, Iron-Chromium-Nickel, Corrosion Resistant, for General Application
ASTM B 687	(1999) Brass, Copper, and Chromium-Plated Pipe Nipples
ASTM D 229	(1996) Rigid Sheet and Plate Materials Used for Electrical Insulation
ASTM F 436	(1993) Hardened Steel Washers
ASTM F 1199	(1988; R 1998) Cast (All Temperature and Pressures) and Welded Pipe Line Strainers (150 psig and 150 degrees F Maximum)

## ASME INTERNATIONAL (ASME)

ASME B16.5	(1996; B16.5a) Pipe Flanges and Flanged Fittings NPS 1/2 thru NPS 24
ASME B16.9	(1993) Factory-Made Wrought Steel

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

## Buttwelding Fittings

ASME B16.11	(1996) Forged Fittings, Socket-Welding and Threaded
ASME B16.21	(1992) Nonmetallic Flat Gaskets for Pipe Flanges
ASME B16.34	(1997) Valves - Flanged, Threaded, and Welding End
ASME B16.39	(1998) Malleable Iron Threaded Pipe Unions Classes 150, 250, and 300
ASME B31.3	(1999) Process Piping
ASME B40.1	(1991) Gauges - Pressure Indicating Dial Type - Elastic Element
ASME BPV IX	(1998) Boiler and Pressure Vessel Code; Section IX, Welding and Brazing Qualifications

## AMERICAN WELDING SOCIETY (AWS)

AWS A5.4	(1992) Stainless Steel Electrodes for Shielded Metal Arc Welding
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## MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS INDUSTRY (MSS)

MSS SP-58	(1993) Pipe Hangers and Supports - Materials, Design and Manufacture
MSS SP-69	(1996) Pipe Hangers and Supports - Selection and Application

## NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA 250	(1997) Enclosures for Electrical Equipment (1000 Volts Maximum)
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## NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 30	(1996; Errata TIA 96-2) Flammable and Combustible Liquids Code
NFPA 70	(1999) National Electrical Code

## THE SOCIETY FOR PROTECTIVE COATINGS (SSPC)

SSPC SP 6/NACE 3	(1994) Commercial Blast Cleaning
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## UNDERWRITERS LABORATORIES (UL)

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

UL 142	1993 Steel Aboveground Tanks for Flammable and Combustible Liquids
UL 567	(1996; Rev thru Oct 1997) Pipe Connectors for Petroleum Products and LP-Gas
UL 2085	(1997) Insulated Aboveground Tanks for Flammable and Combustible Liquids

## 1.2 SYSTEM DESCRIPTION

The work shall include the design, fabrication and installation of the entire fuel storage and dispensing type system in conformance with pertinent federal, state, and local code requirements. The completed installation shall conform to NFPA 30 .

## 1.3 PAYMENT

No separate payment shall be made items and work contained in this specification. Payment shall be incidental to bid item CONTROL BUILDINGS

## 1.4 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01335 SUBMITTAL PROCEDURES:

## SD-01 Data

Fueling System; GA, ED.

Manufacturer's standard catalog data, prior to the purchase or installation of the particular component, highlighted to show brand name, model number, size, options, performance charts and curves, etc., in sufficient detail to demonstrate compliance with contract requirements on all parts and equipment.

Registration; GA, RE, .

Required tank registration forms, 30 days after contract award, in order for the Contracting Officer to submit the forms to the regulatory agency.

Spare Parts Data; GA, ED.

Spare parts data for each different item of equipment specified, after approval of detail drawings and not later than 1 month prior to the date of beneficial occupancy. The data shall include a complete list of parts and supplies, with current unit prices and source of supply, a recommended spare parts list for 1 year of operation, and a list of the parts recommended by the manufacturer to be replaced on a routine basis.



SD-04 Drawings

Fueling System; GA, ED.

Detail drawings including a complete list of equipment and materials. Detail drawings shall contain:

- a. Complete piping and wiring drawings and schematic diagrams of the overall system.
- b. Equipment layout and anchorage.
- c. Clearances required for maintenance and operation.
- d. Any other details required to demonstrate that the system has been coordinated and will properly function as a unit.

Monitoring Systems; GA, ED.

Detail drawings of the monitoring system including a complete list of equipment and materials. Drawings shall contain:

- a. An overview drawing which details the leak detection system operation.
- b. An overview drawing which details the liquid level and setpoint monitoring.
- c. Wiring schematics for each part of the fueling system. The schematics shall indicate each operating device along with their normal ranges of operating values (including pressures, temperatures, voltages, currents, speeds, etc.).
- d. Single line diagrams of the system.
- e. Panel layout along with panel mounting and support details.

SD-06 Instructions

Installation; GA, ED

Manufacturer's installation instructions and procedures on all parts and equipment.

Framed Instructions; GA, ED.

Framed instructions for posting, at least 2 weeks prior to construction completion.

Monitoring Systems; GA, ED.

System diagrams for posting, at least 2 weeks prior to

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

construction completion, including distance markings so that alarm indications can be correlated to leak location in plan view if a cable detection system is used. The diagrams shall include a piping and wiring display map with schematic diagrams from the leak detection system manufacturer. The diagrams shall be framed under glass or laminated plastic and be posted where indicated by the Contracting Officer.

## SD-07 Schedules

Tests; GA, ED.

A letter, at least 14 working days in advance of each test, advising the Contracting Officer of the test. Individual letters shall be provided for each test specified herein.

Demonstrations; GA, RE.

A letter, at least 14 working days prior to the proposed training date, scheduling a proposed date for conducting the onsite training.

## SD-08 Statements

Experience; GA, RE.

A letter listing prior projects, the date of construction, a point of contact for each prior project, the scope of work of each prior project, and a detailed list of work performed. The letter shall also provide evidence of prior manufacturer's training, state licensing, and other related information.

Welding; GA, RE.

A letter listing the qualifying procedures for each welder. The letter shall include supporting data such as test procedures used, what was tested to, etc., and a list of the names of all qualified welders and their identification symbols.

Verification of Dimensions; GA, RE.

A letter stating the date the site was visited and a listing of all discrepancies found.

Fuel Supply; GA, RE.

A letter, at least 30 days prior to fuel delivery, stating the amount of fuel required for testing, flushing, cleaning, or startup of the system. The letter shall define the required dates of each fuel delivery necessary.

## SD-09 Reports

Tests; GA, ED.

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

Six copies of each test containing the information described below in bound letter-size booklets. Individual reports shall be provided for the storage tank tests, the piping tests, the system performance tests, the high level alarm test, and the system leak tests. Drawings shall be folded blue lines, with the title block visible.

- a. The date the tests were performed.
- b. A list of equipment used, with calibration certifications.
- c. A copy of measurements taken.
- d. The parameters to be verified.
- e. The condition specified for the parameter.
- f. The inspection results, signed, dated, and certified by the installer. The certification shall state that required procedures were accomplished, that the procedures were conducted in compliance with the plans and specifications.
- g. A description of adjustments performed.

## SD-19 Operations Manuals

Operation Manuals; GA, ED.

Six complete copies of operation manuals shall be furnished in accordance with Section 01800

Maintenance Manuals; GA, ED.

Six complete copies of maintenance manuals shall be furnished in accordance with Section 01800

## 1.5 QUALIFICATIONS

## 1.5.1 Experience

Each installation Contractor shall have successfully completed at least 3 projects of the same scope and the same size or larger within the last 6 years. Each installation Contractor shall demonstrate specific installation experience in regard to the specific system installation to be performed. Each installation Contractor shall have taken, if applicable, manufacturer's training courses on the installation of piping, leak detection, and tank management systems and meet the licensing requirements in the state.

## 1.5.2 Welding

Welding shall be in accordance with qualifying procedures using performance qualified welders and welding operators. Welding tests shall be performed

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

at the work site. Procedures and welders shall be qualified in accordance with ASME BPV IX. Each welder or welding operator shall apply his assigned symbol near each weld he makes as a permanent record. Structural members shall be welded in accordance with Section WELDING, STRUCTURAL.

## 1.6 Registration

Contractor shall obtain and complete all required tank registration forms required by federal, state, and local authorities.

## 1.7 DELIVERY, STORAGE, AND HANDLING

Stored items shall be protected from the weather and contamination. Proper protection and care of material before, during, and after installation shall be the Contractor's responsibility. Any materials found to be damaged shall be replaced at the Contractor's expense. During installation, piping and similar openings shall be capped to keep out dirt and other foreign matter.

## 1.8 PROJECT/SITE CONDITIONS

## 1.8.1 Verification of Dimensions

After becoming familiar with all details of the project, the Contractor shall verify dimensions in the field, and advise the Contracting Officer of any discrepancy before performing any work.

## 1.8.2 Fuel Supply

Fuel required for the flushing, cleaning, and testing of materials, equipment, piping, pumps, instruments, etc. shall be provided by the Contractor. Fuel will be provided by tank trucks. The Contractor will furnish the tank trucks, operators, equipment, and services required for the tank truck operations. The Contractor shall provide the labor, equipment, appliances, and materials required for the flushing, cleaning, and testing operations. Systems shall not be flushed, cleaned, or tested with any fuel or liquid not intended for final system operation. Fuel used in the system shall remain the property of the Government. Contractor shall provide additional fuel to fill fuel storage tanks to 90% full after flushing, cleaning and testing operations have been concluded.

## 1.8.3 Safety Requirements

Exposed moving parts, parts that produce high operating temperatures and pressures, parts which may be electrically energized, and parts that may be a hazard to operating personnel shall be insulated, fully enclosed, guarded, or fitted with other types of safety devices. Safety devices shall be installed so that proper operation of equipment is not impaired.

## PART 2 PRODUCTS

## 2.1 STANDARD PRODUCTS

Materials and equipment shall be standard products of a manufacturer

regularly engaged in the manufacturing of such products, which are of a similar material, design and workmanship. The standard products shall have been in satisfactory commercial or industrial use for 2 years prior to submittal date. The 2 year use shall include applications of equipment and materials under similar circumstances and of similar size. The 2 years experience shall be satisfactorily completed by a product which has been sold or is offered for sale on the commercial market through advertisements, manufacturer's catalogs, or brochures. Products having less than a 2 year field service record will be acceptable if a certified record of satisfactory field operation, for not less than 6000 hours exclusive of the manufacturer's factory tests, can be shown. Products shall be supported by a service organization. System components shall be environmentally suitable for the indicated locations. The completed installation shall conform to the applicable requirements of NFPA 30.

## 2.2 NAMEPLATES

Parts and equipment specified herein shall have an attached nameplate to list the manufacturer's name, address, component type or style, model or serial number, catalog number, capacity or size, and the system which is controlled. Plates shall be durable and legible throughout equipment life and made of anodized aluminum or stainless steel. Plates shall be fixed in prominent locations with nonferrous screws or bolts.

## 2.3 ELECTRICAL WORK

Electrical equipment, motors, and wiring shall be in accordance with Section 16415 ELECTRICAL WORK, INTERIOR. Electrical bonding of materials shall be performed in accordance with NFPA 70.

## 2.4 MATERIALS IN CONTACT WITH FUEL

Galvanized materials (zinc coated) shall not be allowed in direct contact with any fuel.

## 2.5 ABOVEGROUND STORAGE TANK

### 2.5.1 1000 Gallon Fuel Storage Tank

Tank system shall conform to either UL 142 or API Std 650 and include a primary storage tank and an integral fully-enclosed secondary containment reservoir. Tank system shall be in accordance with NFPA 30. Tank system shall be designed and manufactured for horizontal installation. Primary storage tank shall be constructed of single wall stainless steel. Secondary containment reservoir shall be single-wall steel or stainless steel. The interstitial space between the storage tank and the containment reservoir shall be filled with a 2-hour fire rated inhibitor in accordance with UL 2085. The volume capacity of the containment reservoir shall be greater than or equal to 100 percent of the primary tank volume. The primary storage tank shall be supported within the containment reservoir with steel tank saddles, or other similar supports, fabricated and attached by the tank manufacturer. Both primary and secondary containment reservoirs shall have normal and emergency venting in accordance with API Std 2000. Tanks constructed in accordance with API Std 650 may operate

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

within 14.7 psia (0 psig) to 15.7 psia (1 psig) range. Tanks listed as UL 142 may operate within 14.7 psia (0 psig) to 15.2 psia (0.5 psig) range. Containment reservoir shall be equipped with a 3 inch drain that includes a full line size steel drainage line and a full line size plug valve. Tank system shall be skid mounted with minimum of 10 inch clearance between tank and the floor and provided with lifting lugs which allow tank system relocation. Tank system shall include a 5 gallon overfill containment which contains spillage of fuel during tank filling.

#### 2.5.2 Tank Exterior Protective Coating

Tank exterior protective coating shall be the manufacturer's standard except as modified herein.

#### 2.5.3 Tank Interior Protective Coating

Tank shall be provided with an interior protective coating in accordance with API RP 1631 from the tank bottom up to 3 feet off the bottom.

#### 2.5.4 Tank Piping Penetrations

The number and size of tank piping penetrations shall be provided as indicated and required these project specifications. Nylon dielectric bushings shall be provided on all pipe connections to a tank. Pipe connections to a tank shall be through welded-in-place double tapered NPT couplings. The termination of fill lines within a tank shall be provided with an antisplash deflector. Tank suction line shall be provided with a footvalve to prevent line drainage.

#### 2.5.5 Tank Cleanout and Gauge Connection

Tank shall be provided with a combination cleanout and gauge connection. The connection shall consist of a 2 inch pipe extending downward through the top of the tank to within 3 inches of the tank bottom. The entire length of pipe inside the tank shall be provided with 1/2 inch wide by 12 inches long slots at alternate locations. The top of the pipe shall be provided with a bronze top-seal type adapter with a corresponding locking type cap. Tank shall have an interior striker/impact plate attached directly under the cleanout and gauge connection. The striker/impact plate shall be a minimum of 1/4 inch in thickness, be larger in diameter than the tank penetration, and fit the curvature of the tank bottom.

#### 2.5.6 Tank Atmospheric Venting

Vent pipe shall be in accordance with NFPA 30 and UL 142. Vent pipe sizing shall be as indicated.

#### 2.5.7 Tank Emergency Venting

Emergency Venting requirements shall be in accordance with NFPA 30. Pressure relief device shall be the rupture disc type calibrated such that that full flow is obtained without exceeding maximum tank design pressure. Start to open pressure for the rupture disc shall be set 90% of the maximum tank design pressure. There is no vacuum relief requirement but the disc

may be subjected to 3 ounces of vacuum. Discs shall be provided with a flanged end connection. Disc holder shall have a nameplate showing design rating.

#### 2.5.8 Tank Alarm System

Tank shall be provided with high liquid level and low liquid level alarm systems. The system shall include a mechanically-actuated float actuators and an alarm panel. The float actuators shall be field adjustable. The alarm panel shall include an alarm light, an audible alarm, and reset capabilities. The alarm panel shall be wall mounted adjacent to the tank. The alarm panel shall initiate a minimum 70 decibel audible alarm when the liquid level within a tank reaches the 30 percent and 90 percent full levels.

The alarm system shall conform to the requirements of paragraph MONITORING SYSTEM.

### 2.6 TANK GAUGES

#### 2.6.1 Stick Gauge

Tank shall be provided with 2 stick gauges graduated in feet, inches, and eighths of an inch. Stick gauge shall be of wood and treated after graduating to prevent swelling or damage from the fuel being stored.

#### 2.6.2 Tank Calibration Charts

Tank shall be furnished with 2 copies of calibrated charts which indicate the liquid contents in gallons for each 1/8 inch of tank depth.

#### 2.6.3 Analog Tank Gauge

Storage tanks shall be provided with an automatic analog reading gauge which is directly mounted to a tank in plain view. Gauge shall be a level sensing, mechanically actuated device which provides the necessary readout in a sealed glass cap contained in a gauge box. Gauge shall be accurate to plus or minus 1/4 inch and be capable of measuring the liquid level over the full range of a tank's height. Gauge shall have vapor tight seals to prevent condensate from fogging the viewing glass.

### 2.7 ADAPTERS AND COUPLERS

#### 2.7.1 Tight-Fit Fill Adapter

Adapter shall be bronze and be fitted with a Buna-N or Viton gasket. Adapter shall be the API standard 3 inch size. Adapter shall be a top seal adapter and provide a tight-fit connection to prevent vapor emissions during filling. The adapter shall be provided with a locking cap. The cap shall mate with the adapter and have a latching mechanism which provides a water tight seal. The cap shall provide some type of locking provision and be easily attachable and removable.

#### 2.7.2 Dry-Break Coupler

Coupler shall be an API standard and provide a tight-fit connection to

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

prevent vapor emissions during fuel transfer. Coupler shall be compatible with the fuel product being handled and be a female connection. Seals within the coupler shall be Buna-N or Viton. Coupler shall have an internal manually operated shutoff valve. The valve shall have an external operating handle with the valve's position (open or close) clearly labeled.

The internal valve shall not be capable of being manually opened unless the coupler is properly connected to a tank truck's tight-fit adapter.

## 2.8 SUPPLEMENTAL COMPONENTS

### 2.8.1 Electrically Isolating Flanges

Flanges shall be provided with an electrical insulating material of 1000 ohms minimum resistance conforming to ASTM D 229. The material shall be resistant to the effects of the type of fuel to be handled. Gaskets shall be full face and be provided between flanges. Flanges shall have full surface 0.03 inch thick, spiral-wound mylar insulating sleeves between the bolts and the holes in the flanges. Bolts may have reduced shanks of a diameter not less than the diameter at the root of the threads. High-strength 1/8 inch thick phenolic insulating washers shall be provided next to the flanges with flat circular stainless steel washers over the insulating washers. Bolts shall be long enough to compensate for the insulating gaskets and stainless steel washers.

### 2.8.2 Electrically Isolating Union

Union shall be provided with an electrical insulating material of 1000 ohms minimum resistance conforming to ASTM D 229. The material shall be resistant to the effects of the type of fuel to be handled.

### 2.8.3 Concrete Anchor Bolts

Concrete anchor bolts shall be group II, Type A, class 2 in accordance with ASTM A 307.

### 2.8.4 Bolts

Bolts shall be in accordance with ASTM A 193/A 193M, Grade B8.

### 2.8.5 Nuts

Nuts shall be in accordance with ASTM A 194/A 194M, Grade 8.

### 2.8.6 Washers

Washers shall be in accordance with , ASTM F 436, flat circular stainless steel. Washers shall be provided under each bolt head and nut.

### 2.8.7 Exterior Coating of Miscellaneous Items

Steel surfaces to be externally coated or painted shall be cleaned to a commercial grade blast cleaning finish in accordance with SSPC SP 6/NACE 3 prior to the application of the coating. Exterior surfaces, other than stainless steel pipe and flexible connectors, which are not otherwise



## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

painted and do not require the application of an exterior coating, as well as all items supplied without factory-applied finish paint, not including primer only items, shall be painted as specified in Section 09900 PAINTING, GENERAL.

## 2.9 MONITORING SYSTEM

## 2.9.1 Aboveground Storage Tanks

The interstitial space of each vaulted tank shall be continuously and automatically monitored to detect breaches in the integrity of the primary tank and the exterior vaulted shell. The interstitial space shall be monitored by an electronic capacitance type liquid sensor capable of distinguishing the difference between hydrocarbons and water. Sensors shall be intrinsically safe for use in Class 1, Division 1, Group D environment as defined by NFPA 70. Sensors shall be easily removed from the tank. Sensors shall be compatible with the electronic monitoring panel.

## 2.9.2 Electronic Monitoring Panel

Panel shall be remotely-mounted on a wall adjacent to the storage tank and shall be capable of providing an audible, visual and remote alarms in the event of a detected leak and/or high/low liquid levels. Audible alarms shall be a buzzer sounding at 70 decibels. Each visual alarm shall indicate the type and location of the alarm condition. Visual alarms shall be capable of delineating between individual alarm conditions. Remote alarm shall be capable of sending a signal to the Control and Instrumentation System specified in Section 16900. Remote alarm shall signal on any alarm condition that attention is required in the fuel storage room. Panel shall provide a means of delineating between individual alarm conditions. Panel shall be housed in a NEMA 4 rated enclosure in accordance with NEMA 250. Panel shall have a hinged door to swing left or right (doors shall not swing up or down). Panel using computer memory shall be capable of maintaining current programmable information in the event of a power failure. Panel shall be provided with a manual acknowledge switch which shall be capable of deactivating the audible alarm. The acknowledge switch shall not be capable of deactivating subsequent audible alarms unless depressed manually again for each occurrence. Under no circumstance shall this acknowledgement switch extinguish the visual alarms until the alarm condition has been corrected. Switches shall be an integral component located on the front panel and be either a key switch or push button.

## 2.10 PIPING COMPONENTS

## 2.10.1 Product Piping

Piping carrying fuel shall be stainless steel as defined herein.

## 2.10.2 Vent Piping

Piping shall be single wall stainless steel as defined herein.

## 2.10.3 Stainless Steel Pipe

Stainless steel pipe 6 inches or smaller shall be in accordance with ASTM A 312/A 312M Schedule 40, Type TP304L, seamless only. Longitudinally welded 6 inch pipe also can be provided if made in accordance with the procedures in ASTM A 358/A 358M with wall thickness of 0.25 inch.

#### 2.10.3.1 Connections

Connections for pipe smaller than 2-1/2 inches shall be forged, socket weld type, Type 304 or 304L, 2000 W.O.G. conforming to ASTM A 182/A 182M and ASME B16.11. Connections for pipe 2-1/2 inches and larger shall be butt weld type conforming to ASTM A 403/A 403M, Class WP, Type 304L, seamless or welded, and ASME B16.9 of the same wall thickness as the adjoining pipe. Piping in inaccessible locations shall be welded.

#### 2.10.3.2 Welding Process and Electrodes

The welding process for stainless steel piping shall be a gas tungsten arc or gas metal arc process in accordance with ASME B31.3. Welding electrodes shall be E308L conforming to AWS A5.4.

#### 2.10.4 Valves

Portions of a valve coming in contact with fuel shall be compatible with the fuel to be handled. Valves shall have bodies, bonnets, and covers constructed of stainless steel conforming to ASTM A 743/A 743M, Type 304 or 316. Each valve shall have stainless steel stem and trim. Valves shall be suitable for a working pressure of 275 psig at 100 degrees F with a weatherproof housing and be provided with flanged end connections unless indicated otherwise. Seats, body seals, and stem seals shall be Viton or Buna-N.

##### 2.10.4.1 Gate

Valve shall be in accordance with API Spec 6D and conform to the fire test requirements of API Spec 6FA. Valve shall be of the flexible wedge disc type, conduit disc type, or double disc type. Valve shall be of the rising stem type with closed yoke, or the non-rising stem type equipped with a device to give positive visual indication of the valve's position.

##### 2.10.4.2 Swing Type Check

Valve shall be swing type conforming to API Spec 6D regular type. Check valves shall be the tilting disc, non-slam type. Discs and seating rings shall be renewable without removing from the line. The disc shall be guided and controlled to contact the entire seating surface.

##### 2.10.4.3 Wafer Type Check

Valves shall conform to API Spec 6D and API Std 594. Wafer type check valves may be provided in lieu of swing check valves in piping sizes larger than 4 inches.

##### 2.10.4.4 Ball

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

Valves 2 inches and larger shall conform to API Spec 6D. Valves smaller than 2 inches shall have one piece bodies and have a minimum bore not less than 55 percent of the internal cross sectional area of a pipe of the same nominal diameter. The ball shall be stainless steel. Valve shall be fire tested and qualified in accordance with API Spec 6FA or API Std 607. Valve shall be non-lubricated and operate from fully open to fully closed with 90 degree rotation of the ball.

## 2.10.4.5 Plug

Valve shall be in accordance with API Spec 6D. Valve shall be non-lubricated, resilient, double seated, trunnion mounted type with a tapered lift plug capable of 2-way shutoff. Valve shall operate from fully open to fully closed by rotation of the handwheel to lift and turn the plug. Valve shall have weatherproof operators with mechanical position indicators.

## 2.10.4.6 Globe

Valve shall conform to ASME B16.34.

## 2.10.4.7 Pressure/Vacuum Vent Relief

Valve pressure and vacuum capacities shall be in accordance with NFPA 30. Valve shall be factory set for 12 ounces per square inch pressure and 0.5 ounce per square inch vacuum. Pressure and vacuum relief shall be provided by a single valve. Valve shall be constructed of cast steel with flanged or threaded end connections. Trim shall be stainless steel. Inner valve pallet assemblies shall have a knife-edged drip ring around the periphery of the pallet to preclude condensation collection at the seats. Pallet seat inserts shall be of a material compatible with the fuel specified to be stored.

## 2.10.5 Accessories

## 2.10.5.1 Foot Valve

Foot valve shall be compatible with the fuel to be handled and with the working pressure of the system. Foot valve shall be the double-poppet design. Foot valve shall be provided with a minimum 20 mesh screen on the intake. Foot valve seats shall be the replaceable type. Foot valve shall be capable of passing through a 3 inch pipe or tank flange.

## 2.10.5.2 Flanges

Flanges installed on equipment, fittings, or pipe shall be Class 150 pound flanges which are rated in accordance with ASME B16.5. Flanges shall be the 1/16 inch raised face type, except for connections to FRP pipe. Connections to FRP pipe shall be made with flat face flanges. Stainless steel flanges shall conform to ASTM A 182/A 182M. Carbon steel flanges shall conform to ASTM A 181/A 181M, Grade 2.

## 2.10.5.3 Flange Gaskets

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

Flange gaskets shall be 1/16 inch thick, NBR, and be in accordance with ASME B16.21. Full-face gaskets shall be provided for flat-face flanged pipe joints. Ring gaskets shall be provided for raised-face flanged pipe joints.

## 2.10.5.4 Steel Coupling

Coupling shall be in accordance with API Spec 5L, seamless, extra heavy, wrought steel with recessed ends.

## 2.10.5.5 Welded Nipple

Nipple shall be in accordance with ASTM A 733 or ASTM B 687 and of the same material as the product piping.

## 2.10.5.6 Threaded Union

Threaded unions shall only be used on cast steel piping 2 inches in nominal size or smaller and only where indicated. Union shall be in accordance with ASME B16.39, Class 150.

## 2.10.5.7 Joint Compound

Joint compounds for any type of piping system shall be resistant to water and suitable for use with fuel containing 40 percent aromatics.

## 2.10.5.8 Flexible Connector

Connectors shall conform to requirements of UL 567 and be the flexible metal hose, corrugated type with braided wire sheath covering. Connectors shall have close-pitch annular corrugations and be rated for a working pressure of at least 275 psig at 100 degrees F. Connectors shall have a minimum 12 inch live length with flanged end connections. Metal for hose and braided wire sheath shall be stainless steel in accordance with ASTM A 167.

## 2.10.5.9 Strainer

Strainer shall be in accordance with ASTM F 1199 except as modified herein.

Strainer shall be the cleanable, basket or "Y" type, and be the same size as the pipeline. Strainer body shall be fabricated of Type 304 or 316 stainless steel with the bottom drilled and tapped. The body shall have arrows clearly cast on the sides indicating the direction of flow. Strainer shall be equipped with a removable cover and sediment screen. Strainer screen shall be wire screen constructed of Type 316 stainless steel with small perforations numbering not less than 400 per square inch to provide a net free area through the basket of at least 3.3 times that of the entering pipe. Flow shall be into the screen and out through the perforations.

## 2.10.5.10 Pipe Hangers and Supports

Hangers and supports shall be of the adjustable type and conform to MSS SP-58 and MSS SP-69, except as modified herein. The finish of rods, nuts,

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

bolts, washers, hangers, and supports shall be hot-dipped galvanized. Nuts, bolts, washers, and screws shall be Type 316 stainless steel when located under any pier. Miscellaneous metal shall be in accordance with ASTM A 36/A 36M, standard mill finished structural steel shapes, hot-dipped galvanized.

- a. Pipe Protection Shields. Shields shall conform to MSS SP-58 and MSS SP-69, Type 40, except material shall be Type 316 stainless steel. Shields shall be provided at each slide type pipe hanger and support.
- b. Low Friction Supports. Supports shall have self-lubricating anti-friction bearing elements composed of 100 percent virgin tetrafluoroethylene polymer and reinforcing aggregates, prebonded to appropriate backing steel members. The coefficient of static friction between bearing elements shall be 0.06 from initial installation for both vertical and horizontal loads and deformation shall not exceed 0.002 inch under allowable static loads. Bonds between material and steel shall be heat cured, high temperature epoxy. Design pipe hangers and support elements for the loads applied. Anti-friction material shall be a minimum of 0.09 inch thick. Steel supports shall be hot-dipped galvanized. Units shall be factory designed and manufactured.

## 2.10.5.11 Pressure Gauge

Gauge shall conform to ASME B40.1. Gauge shall be single style pressure gauge for fuel with 4 or 4-1/2 inch dial, have brass or aluminum case, bronze tube, stainless steel ball valve, pressure snubbers, and scale range for the intended service.

## PART 3 EXECUTION

## 3.1 INSTALLATION

Storage tanks shall be handled with extreme care to prevent damage during placement and shall be installed in accordance with the manufacturer's installation instructions and NFPA 30. The exterior surface of each tank shall be inspected for obvious visual damage prior to and proceeding the placement of each storage tank. Surface damage to a storage tank shall be corrected according manufacturer's requirements before proceeding with the system installation.

## 3.1.1 Equipment

Equipment shall be properly leveled, aligned, and secured in place in accordance with manufacturer's instructions. Supports shall be provided for equipment, appurtenances, and pipe as required. Anchors, bolts, nuts, washers, and screws shall be installed where required for securing the work in place. Sizes, types, and spacings of anchors and bolts not indicated or specified shall be as required for proper installation.

## 3.1.2 Piping

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

Piping shall be inspected, tested, and approved before concealing. Piping shall be installed straight and true to bear evenly on supports. Piping shall be free of traps, shall not be embedded in concrete pavement, and shall drain toward the storage tank. Any pipe, fittings, or appurtenances found defective after installation shall be replaced. Piping connections to equipment shall be as indicated or as required by the equipment manufacturer. Pipe and accessories shall be handled carefully to assure a sound, undamaged condition. The interior of the pipe shall be thoroughly cleaned of foreign matter and shall be kept clean during installation. The pipe shall not be laid in water or stored outside unprotected when weather conditions are unsuitable. When work is not in progress, open ends of pipe and fittings shall be securely closed so that water, earth, or other substances cannot enter the pipe or fittings. Cutting pipe, when necessary, shall be done without damage to the pipe. Pipe shall be reamed to true internal diameter after cutting to remove burrs. Changes in pipe sizes shall be made through tapered reducing pipe fittings. Stainless steel pipe shall in no case be welded directly to carbon steel pipe. Fuel supply piping from a storage tank shall extend to within 6 inches of the tank's bottom.

## 3.1.2.1 Pipe Hangers and Supports

Seismic requirements shall be in accordance with Sections 13080, SEISMIC PROTECTION FOR MISCELLANEOUS EQUIPMENT and 15070 SEISMIC PROTECTION FOR MECHANICAL EQUIPMENT. Additional hangers and supports shall be installed for concentrated loads in piping between hangers and supports, such as for valves. Miscellaneous steel shapes as required shall be installed in accordance with ASTM A 36/A 36M. Pipe supports shall be installed in accordance with MSS SP-58 and MSS SP-69. Pipe spacing shall be as follows:

Nominal Pipe Size (Inches)	One and Under	1.5	2	3	4	6	8	10	12
Maximum Hanger Spacing (Feet)	7	9	10	12	14	17	19	22	23

## 3.1.2.2 Pipe Sleeve

Piping passing through concrete or masonry construction shall be fitted with sleeves. Sleeve shall be of sufficient length to pass through the entire thickness of the associated structural member and be large enough to provide a minimum clear distance of 1/2 inch between the pipe and sleeve. Sleeves through concrete shall be 20 gauge steel, or other material as approved by the Contracting Officer. Sleeves shall be accurately located on center with the piping and securely fastened in place. The space between a sleeve and a pipe shall be caulked and sealed as specified in Section 07900 JOINT SEALING. In fire walls and fire floors, both ends of a pipe sleeve shall be caulked with UL listed fill, void, or cavity material as specified in Section 07840 FIRESTOPPING.

## 3.1.3 Field Painting

Painting required for surfaces not otherwise specified, and finish painting of items only primed at the factory, shall be painted and have

identification markings applied as specified in Section 09900 PAINTING, GENERAL. Stainless steel and aluminum surfaces shall not be painted. Prior to any painting, surfaces shall be cleaned to remove dust, dirt, rust, oil, and grease.

#### 3.1.4 Framed Instructions

Framed instructions shall include equipment layout, wiring and control diagrams, piping, valves, control sequences, and typed condensed operation instructions. The condensed operation instructions shall include preventative maintenance procedures, methods of checking the system for normal and safe operation, and procedures for safely starting and stopping the system. The framed instructions shall be framed under glass or laminated plastic and be posted where directed by the Contracting Officer. The framed instructions shall be posted before acceptance testing of the system.

### 3.2 TESTS

#### 3.2.1 Aboveground Storage Tank Tightness Tests

A tightness test shall be performed on each aboveground storage tank. The tests shall be performed prior to making piping connections. Tests shall be capable of detecting a 0.1 gph leak rate from any portion of the tank while accounting for effects of thermal expansion or contraction. Gauges used in the tightness tests shall have a scale with a maximum limit of 10 psig. Each storage tank shall be pressurized with air to 5 psig and monitored for a drop in pressure over a 2-hour period during which there shall be no drop in pressure in the tank greater than that allowed for pressure variations due to thermal effects. The pneumatic test shall be performed again in the event a leak is discovered.

#### 3.2.2 Manufacturer's Tank Tests

Following the tank tightness test, each storage tank shall be leak tested in accordance with the manufacturer's written test procedure if the manufacturer's test procedure is different from the tightness tests already performed. Any test failure shall require corrective action and retest.

#### 3.2.3 Piping Pneumatic and Hydrostatic Tests

Testing shall comply with the applicable requirements of ASME B31.3, NFPA 30, and the requirements specified herein. Care shall be taken not to exceed pressure rating of various fittings. Hydrostatic testing shall be performed using fuel as the liquid. Water shall not be introduced into the system for testing. To facilitate the pneumatic and hydrostatic tests, various sections of the piping system may be isolated and tested separately. Where such sections terminate at flanged valve points, the line shall be closed by means of blind flanges in lieu of relying on the valve. Tapped flanges shall be provided to allow a direct connection between the piping and the air compressor and/or pressurizing pump. Tapped flanges shall also be used for gauge connections. Taps in the permanent line will not be permitted. Gauges shall be subject to testing and approval. In the event leaks are detected, the pipe shall be repaired and

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

the test repeated. Following satisfactory completion of each pneumatic and hydrostatic test, the pressure shall be relieved and the pipe immediately sealed. Provision shall be made to prevent displacement of the piping during testing. Personnel shall be kept clear of the piping during pneumatic testing. Equipment such as pumps, tanks, and meters shall be isolated from the piping system during the testing.

#### 3.2.3.1 Pneumatic Procedures for Product and Vent Piping

A pneumatic test pressure shall be applied in increments. A preliminary 25 psig test shall be applied. The pressure shall be maintained while soapsuds or equivalent materials are applied to the exterior of the piping. While applying the soapsuds, the entire run of piping, including the bottom surfaces, shall be visually inspected for leaks (bubble formations). Leaks discovered shall be repaired in accordance with manufacturer's instructions and retested. Following the preliminary test, the piping shall be tested at a pressure of 50 psig for not less than 2 hours, during which time there shall be no drop in pressure in the pipe greater than that allowed for thermal expansion and contraction. The pressure source shall be disconnected during the final test period. Any leaks revealed by the test shall be repaired and the test repeated.

#### 3.2.3.2 Hydrostatic Procedures for Product Piping

Upon completion of pneumatic testing each piping system shall be hydrostatically tested with fuel at not more than 275 psig in accordance with ASME B31.3 and API RP 1110, with no leakage or reduction in gauge pressure for 4 hours. The Contractor shall furnish electricity, instruments, connecting devices, and personnel for the test. Fuel will be furnished by the Government. Defects in work performed shall be corrected at the Contractor's expense, and the test repeated until the work is proven to be in compliance with the testing procedures. Any release of fuel (no matter the size) during testing shall be immediately contained, the pressure on the piping relieved, and the piping drained of fuel. The Contracting Officer shall be notified immediately of a fuel release, the exact location, an estimated quantity of release, and a discussion of the containment measures taken.

#### 3.2.4 System Performance Tests

After all components of the system have been properly adjusted, the system shall be tested to demonstrate that the system meets the performance requirements for which it was designed. The maximum rated capacity of the system shall be tested. If any portion of the system or any piece of equipment fails to pass the tests, the Contractor shall make the necessary repairs or adjustments and the test shall be repeated until satisfactory performance is obtained from the Contracting Officer. The tests shall demonstrate the following:

- a. The capability of each fuel pump to deliver the indicated flow of fuel.
- b. The alarm and control panels are operational and perform as designed.



- . Vent piping is clear of debris and each pressure/vacuum relief vent is operating properly.

### 3.2.5 High and Low Liquid Level Alarm Test

Low liquid level alarm shall be tested prior to filling storage tank to verify it functions in the remote alarm panel . Storage tank shall initially be filled, with the appropriate product, to approximately 32 percent capacity to verify low liquid alarm is silenced. Storage tank shall then be overfilled with the appropriate product in order to verify the high liquid level alarms in the remote alarm panel function as designed. The Contractor shall not overfill any storage tank more than 92 percent level. Any problems with the electronic panel shall be corrected and retested. The system shall be drained below the high liquid levels following all tests.

### 3.3 FLUSHING, CLEANING AND ADJUSTING

Following installation and equipment testing but prior to system performance testing, the following flushing, cleaning, and adjustments shall be performed.

#### 3.3.1 Preparations for Flushing

##### 3.3.1.1 Initial System Cleaning

The interior of each fuel storage tank shall be visually inspected and cleaned free of debris before filling. In the event of entry into a storage tank, the Contractor shall ensure a safe atmosphere exists. Contractor shall remove all preservatives and foreign matter from valves, line strainers, pumps, and other equipment coming in contact with fuel. No fuel will be delivered to the system until the Contractor has satisfactorily completed this initial system cleaning.

##### 3.3.1.2 Protection of Equipment

Temporary 40 mesh cone type strainers shall be installed in the suction line ahead of each pump. The strainers shall be constructed of the same material as the piping and shall be compatible with the fuel to be handled.

The temporary strainers shall remain in place for a minimum of 2 days after system startup, after which time the Contractor shall remove the strainers and prepare the piping as intended for final system operation.

#### 3.3.2 System Flushing

##### 3.3.2.1 Initial Fuel Supply

Following the preparations for flushing, each storage tank shall be filled to a 25 percent capacity with the proper fuel according to the fueling system's final operational requirements. Following the initial fuel supply, each storage tank's fuel temperature and liquid level shall be measured and recorded. The liquid level shall be measured using a manual tank gauge.

### 3.3.2.2 Disposal of Initial Fuel Supply

In the event the fuel contained in the piping system at the conclusion of the flushing operation is not considered by the Contracting Officer to be of satisfactory quality for the desired use, the Contractor shall be responsible for pumping out the entire fuel supply from the storage tanks and the piping system. The piping system shall be completely drained to the storage tank. Disposition of the fuel removed from the system shall be the responsibility of the Contractor.

### 3.3.3 Cleaning Equipment

Upon completion of flushing operations, permanent strainers shall be removed, cleaned, and reinstalled.

### 3.3.4 Initial System Adjustments

Following the flushing and cleaning operations, each system component shall be initially adjusted, if necessary, to meet the system's final operational requirements. Flow rates and pressures shall be adjusted as required to meet the indicated requirements. The sequence of control for each component shall be adjusted to meet the indicated system requirements. Following the initial system adjustments, the equipment tests shall be performed in order to determine any necessary final system adjustments.

## 3.4 DEMONSTRATIONS

### \*1

Contractor shall conduct a training course for the operating staff as designated by the Contracting Officer. The training period shall consist of a total of **4** hours of normal working time and shall start after the system is functionally completed but prior to final system acceptance. The field instructions shall cover all of the items contained in the operation and maintenance manuals as well as demonstrations of routine maintenance operations.

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-- End of Section --

SECTION TABLE OF CONTENTS

DIVISION 13 - SPECIAL CONSTRUCTION

SECTION 13502

INCLINOMETERS

PART 1 GENERAL

- 1.1 REFERENCES
- 1.2 SUBMITTALS
- 1.3 MEASUREMENT AND PAYMENT
  - 1.3.1 Furnishing and Installing
  - 1.3.2 Maintenance and Monitoring
- 1.4 DELIVERY, HANDLING, AND STORAGE
- 1.5 WARRANTY

PART 2 PRODUCTS

- 2.1 MATERIALS
  - 2.1.1 Inclinator Casing
  - 2.1.2 Inclinator Casing Couplers and Caps
  - 2.1.3 Backfill Materials
  - 2.1.4 Protective Cover
  - 2.1.5 Guard Posts
  - 2.1.6 Inclinator Probe
  - 2.1.7 Cable and Clamping Device
  - 2.1.8 Data Recorder
  - 2.1.9 Manual Readout Device and Accessories
- 2.2 FABRICATION

PART 3 EXECUTION

- 3.1 INSTALLATION
  - 3.1.1 Installation of Borehole
  - 3.1.2 Preparation of Borehole and Installation of Inclinator Casing
  - 3.1.3 Orientation of Inclinator Casing
  - 3.1.4 Filling of Annular Space
- 3.2 PROTECTION
  - 3.2.1 Protective Cover
  - 3.2.2 Guard Posts
- 3.3 POST-INSTALLATION TESTING
- 3.4 FINAL ACCEPTANCE
- 3.5 EQUIPMENT CALIBRATION

-- End of Section Table of Contents --

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## SECTION 13502

## INCLINOMETERS

## PART 1 GENERAL

The work covered by this section consists of furnishing all plant, labor, equipment, and materials; and performing all operations required to maintain, monitor, and install supplemental inclinometers as directed by the Contracting Officer in the sheet pile cells and binwalls at the locations shown on the drawings.

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

KAR

Kentucky  
Administrative  
Regulations

## 1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. When used, a designation following the "GA" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with section 01335 SUBMITTAL PROCEDURES:

SD-01, Data

Product Data; GA, RE

If directed by the Contracting Officer to install supplemental inclinometers, the Contractor shall submit the Instrumentation Plan along with manufacturer's product data to the Government for approval, including any requests for consideration of substitutions, as specified herein, together with instruction manuals at least 10 days prior to installation.

SD-18, Records

Installation Records; FIO.

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

Within 5 workdays of each inclinometer installation, the Contractor shall submit to the Government an installation record sheet and post-installation testing report. The installation record sheet shall include date of inclinometer installation, length of inclinometer casing installed, elevation of the top of casing and of the top of rock, and quantity of grout used for backfilling. The post-installation report shall document the performance of the tests outlined in Paragraph 3.3, the date of the testing was accomplished, the signatures of the individuals performing the tests and checking the work, and certification of final acceptance. Final acceptance criteria shall be as set forth in Paragraph 3.4.

### 1.3 MEASUREMENT AND PAYMENT

#### 1.3.1 Furnishing and Installing

Furnishing and installing the inclinometers specified herein will not be measured for payment. All costs associated with this work shall be included in the lump sum price for "Instrumentation" contained in the bid schedule.

#### 1.3.2 Maintenance and Monitoring

Separate payment will not be made for the monitoring and maintenance of the inclinometers specified herein. All costs associated with this work shall be included in the unit price for "Operation & Maintenance of Completed Work (Including Power, Maintenance, Monitoring and Repair for all Water Control, Instrumentation and Other Completed Work)" contained in the Bid Schedule. This daily rate shall constitute full compensation for furnishing all labor, equipment, and supplies for monitoring and maintaining the inclinometers and any equipment related thereto. Payments based on the daily contract unit price will begin once the water control system is installed, and unwatering of the cofferdam is initiated. Payments at the contract unit price will continue to be made for the total balance of the contract period as extended by the Contracting Officer for excusable delays until the lock construction is complete in accordance with the terms of the contract or as directed by the Contracting Officer. The Contractor shall fully perform but shall not be compensated for any periods of delay determined by the Contracting

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

Officer to be inexcusable. In the event it becomes necessary to flood the cofferdam, a revised unit price per day shall be negotiated with the Contracting Officer for the period between initiation of emergency flooding through the completion of the unwatering process.

## 1.4 DELIVERY, HANDLING, AND STORAGE

All materials shall be received at the site undamaged and shall be stored in a clean, safe area; protected from the weather and contamination.

Inclinometer casing shall be kept flat and evenly supported during transport and storage, and shall be stored away from sources of heat, including direct sunlight. Any materials damaged by mishandling will be rejected by the Government for use and shall be replaced at the Contractor's expense.

## 1.5 WARRANTY

The Contractor shall provide to the Government the manufacturer's warranty for each instrument and readout unit within 3 workdays of receipt of the instrument.

## PART 2 PRODUCTS

Materials and equipment shall conform to the requirements indicated herein, and when not covered thereby, materials and equipment of the best commercial grade quality suited to the intended use and as approved by the Contracting Officer shall be furnished. All inclinometer materials in Paragraphs 2.1.1, 2.1.2, 2.1.6, 2.1.7, 2.1.8, and 2.1.9 shall be from the same manufacturer.

## 2.1 MATERIALS

## 2.1.1 Inclinometer Casing

Inclinometer casing shall be compatible with the inclinometer probe furnished. Inclinometer casing shall consist of Model Nos. 57500100 or 57500105 manufactured by Slope Indicator Company of Seattle, Washington, or approved equal, and shall be constructed of self-aligning, high-impact ABS plastic with continuous, longitudinal grooves inside the casing at the quarter points of the circumference. The casing shall be furnished in 5- or 10-foot lengths with an outside diameter of 3.38 inches, a wall thickness of 0.0093 inches, and a spiral of less than or equal to 1/3 degree per 10

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

feet.

#### 2.1.2 Inclinator Casing Couplers and Caps

Inclinometer casing couplers shall consist of Model No. 57500200 manufactured by Slope Indicator Company of Seattle, Washington, or approved equal, and shall be constructed of self-aligning, high-impact ABS plastic. Couplers shall be compatible with casing and of the same manufacture.

The couplers shall be non-telescoping, shall employ "O" ring seals, and shall lock together with the casing using nylon lock wires. Inclinator casing bottom caps shall consist of Model No. 57500500 manufactured by Slope Indicator Company of Seattle, Washington, or approved equal, and shall be constructed of high-impact ABS plastic. Bottom caps shall lock together with the casing using a nylon lock wire. Inclinator top caps shall consist of Model No. 51100500 manufactured by Slope Indicator Company, or approved equal, and shall be constructed of high-impact ABS plastic.

#### 2.1.3 Backfill Materials

Backfill material shall be bentonite-cement grout and shall consist of 1 part by weight bentonite, 2 part by weight cement, and sufficient water to make the mix pumpable.

#### 2.1.4 Protective Cover

The top of the inclinometer casing shall be centered in a hinged, lockable protective cover which provides 2 inches of clearance above the top of the casing. The protective cover shall consist of Model No. TC-600 manufactured by Brainard-Kilman, or approved equal, and shall be constructed of steel, with zinc plating. The protective cover shall measure at least 8 inches square in plan dimension and a minimum of 5 feet in length.

#### 2.1.5 Guard Posts

Guard Posts shall be placed around the inclinometer casing and protective cover and shall consist of a 6-inch diameter, Schedule 40 steel pipe, filled with concrete, primed and painted Safety Orange.

#### 2.1.6 Inclinator Probe

An inclinometer probe shall be retained from the cofferdam contractor to provide measurement of

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

lateral movements of the casing. If replacement is required, the inclinometer probe shall consist of Model No. 50302500 manufactured by the Slope Indicator Company of Seattle, Washington, or an approved equal, and shall be manufactured by a company specializing in geotechnical instrumentation, with at least 10 years experience in the design and manufacture of inclinometers. The probe shall have 2 servo-accelerometers in a stainless steel waterproof housing. The housing shall have 2 sets of self-centering, spring-loaded wheels, spaced 2.0 feet apart, which tightly fit into the grooves in the casing and self-center the probe within the casing. The accelerometers shall each contain a pendulum supported on pivot bearings, with one axis oriented to detect rotation in the plane of the wheels, and one axis at 90 degrees to the plane of the wheels so that the angle of inclination of the sensor and casing is measured in 2 orthogonal directions. The accelerometers shall be force-balanced, servo-type, responding to deflection from a null position with a current through restoring coils necessary to return the pendulum to the null position. The voltage in the restoring coils shall be proportional to the sine of the angle of rotation with a range of plus or minus 30 degrees. The sensor shall have a sensitivity of at least 15 arc seconds and a temperature drift coefficient of less than 0.005 percent of the reading per degree Fahrenheit. The inclinometer probe shall be compatible with the inclinometer casing provided.

## 2.1.7 Cable and Clamping Device

One 200-foot cable shall be provided to connect the data recorder with the inclinometer probe which shall carry the signal and suspend the probe in the casing. The cable shall have a waterproof connection at the probe and a rapid connect/disconnect plug at the indicator end. The cable shall have a stranded steel core to bear pulling stresses and have a heavy waterproof neoprene cover with 1-foot interval marks and a color code or labeling method for rapid depth determination. The individual insulated conductors, the stranded steel core, and the neoprene jacket shall be bonded together to prevent slippage when the cable is clamped. One clamping device with a 6-inch diameter pulley shall be provided which shall clamp onto the casing to hold the probe steady while readings are taken. The cable shall be a Slope Indicator cable model number 5060100 or approved equal.



## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

## 2.1.8 Data Recorder

The Inclinometer Data Recording Device shall consist of Model. No. 50310900, Digitilt Datamate, manufactured by Slope Indicator Company of Seattle, Washington, or approved equal, and shall be manufactured by a company specializing in Geotechnical instrumentation, with at least 10 years experience in the design and manufacture of inclinometer data recorders. This device shall connect to the probe using the cable supplied with the probe. The data recorder shall take readings on the sensors for both axes on command, store the data, and be capable of check sum statistical analyses of the data. The device shall be portable and operable by rechargeable batteries with a charger provided. The data logger shall be capable of recording data for 8 hours without recharging, and shall be equipped with an RS 232 data port. Software shall be provided to transfer all inclinometer readings to an IBM compatible PC for reduction and graphing.

## 2.1.9 Manual Readout Device and Accessories

All manual readout devices, data loggers, and accessory devices used to read the inclinometer casings during construction shall be available for use by the Contracting Officer at all times and shall become Government property at the conclusion of the contract. The Contractor shall maintain all devices in working condition until they are turned over to the Government.

## 2.2 FABRICATION

Materials shall be fabricated by the manufacturer and assembled onsite in accordance with the Specifications.

## PART 3 EXECUTION

## 3.1 INSTALLATION

The Contractor shall install supplemental inclinometer casings at the locations as directed by the Contracting Officer. Drilling for the inclinometers shall be performed by a certified driller in accordance with the Kentucky Department of Environmental Protection, Division of Water regulations (KAR). Any casings or installations damaged by the Contractor's operation shall be replaced immediately at the Contractor's expense.

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

Refer to section 01400 Environmental Protection for additional requirements regarding disposal of drilling fluids, water, and groundwater protection plan prevention and implementation.

#### 3.1.1 Installation of Borehole

Each inclinometer casing shall be installed in a borehole extending a minimum of 10 feet into the foundation limestone as shown on the Drawings. The borehole shall be a minimum of 5.5 inches in diameter and shall be drilled using rotary drill methods with a drilling fluid capable of removing the cuttings from the borehole. The vertical orientation of the borehole shall not vary more than 3 degrees over its entire length.

#### 3.1.2 Preparation of Borehole and Installation of Inclinometer Casing

When the borehole is complete to the required depth, it shall be thoroughly flushed of all sediment. The inclinometer casing shall then be assembled and lowered into the hole. Each coupling shall be assembled by lubricating the "O" rings and lockwire grooves and then joining the casing and coupling with the nylon lock wires. A minimum of 3/4-inch diameter grout tube shall be attached to the outside of the casing. To offset the buoyant force of the drilling fluid in the hole, the casing may be filled with clean water as it is installed. After the casing has been installed to the bottom of the hole, it shall be trimmed to length.

#### 3.1.3 Orientation of Inclinometer Casing

The grooves in the inclinometer casing shall be oriented parallel and perpendicular with the axes of the cofferdam. The primary axis of the inclinometer casing shall be perpendicular to the axis of the cofferdam.

#### 3.1.4 Filling of Annular Space

When the casing has been installed to the required depth and weighted to resist buoyant forces, the annular space between the outside of the casing and the side of the hole shall be filled with a bentonite cement grout to adjacent grade. The grout shall be pumped into the hole from the bottom up, through a minimum 3/4-inch diameter grout tube attached to the outside of the casing. The top of the casing shall be capped to prevent the entry of grout or other materials into the casing. The

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

inclinometer casing shall be protected against damage during filling of the annular space or other construction activities. Any inclinometer casing damaged by the Contractor's activities shall be replaced at the Contractor's expense.

### 3.2 PROTECTION

#### 3.2.1 Protective Cover

After the grout has set, the area around the casing shall be excavated to a depth of 2 feet and grout removed from the casing to that depth. The protective cover shall be installed a minimum of 2 feet below grade and shall be set in concrete conforming to the requirements of SECTION 03300 and having a compressive strength of not less than 3,000 pounds per square inch at the age of 28 days.

The concrete shall extend inside the cover to 6 inches below the top of the inclinometer casing. The inclinometer casing shall be protected against damage during placement of the protective cover or other construction activities. Any inclinometer casing damaged by the Contractor's activities shall be replaced at the Contractor's expense.

#### 3.2.2 Guard Posts

2 Guard posts shall be installed around each inclinometer and shall extend a minimum of 2 feet below grade and a minimum of 4 feet above grade. The guard posts shall be set in concrete conforming to the requirements of SECTION 03300 and having a compressive strength of not less than 3,000 pounds per square inch in a common excavation with the protective cover (see Paragraph 3.3.1) which shall extend 12 inches beyond the edges of the guard posts in all directions. The guard posts shall be filled with concrete conforming to the requirements of SECTION 03300 and having a compressive strength of not less than 3,000 pounds per square inch which shall be rounded a minimum of 1-inch high at the top. The guard posts shall be primed and painted Safety Orange.

### 3.3 POST-INSTALLATION TESTING

The orientation of the inclinometer casing shall be within 5 degrees of the orientation specified in paragraph 3.1.3. A 2.0-foot section of casing with a coupling attached shall be provided to slip over the top of the casing to provide access for reading the casing. Upon completion of inclinometer casing installation, the clamping device shall be fastened

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

to the top of this portable 2.0-foot length of casing. The inclinometer probe shall then be lowered to the bottom of the casing and the casing inclination data recorded at 2-foot depth increments, as the probe is removed, in accordance with the manufacturer's recommendations. This set of readings shall then be repeated. Acceptance testing shall be performed within 2 workdays after the inclinometer casing is installed.

### 3.4 FINAL ACCEPTANCE

If, during performance of the acceptance testing described in Paragraph 3.3, the casing has no obstructions, the probe wheels track properly in the grooves, 2 sets of repeatable data are obtained, and the orientation is correct, the installation will be approved and accepted. If 2 sets of repeatable data are not obtained within 5 workdays of completion of inclinometer casing installation, the casing shall be abandoned at the direction of the Contracting Officer and a new inclinometer casing installed at the Contractor's expense. Repeatable data shall be defined as less than 0.1 inch variation for every 100 feet of inclinometer casing between 2 sets of readings

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### 3.5 EQUIPMENT CALIBRATION

The inclinometer probe and data collector equipment shall be calibrated at regular, periodic intervals.

As part of the instrumentation plan, calibration procedures and schedules for the equipment shall be developed based on manufacturer's recommendations and industry practices. All calibration activities shall be reported and documented. All calibrated equipment shall be tagged, noting the company performing calibration, the date of the calibration and the calibration status. In no case shall uncalibrated, out-of-calibration, or undocumented instrumentation equipment be used. Calibration activities shall be coordinated to minimize down-time to the instrumentation monitoring program, and the Contractor shall notify the Contracting Officer in advance of sending equipment for calibration. The calibrations shall be scheduled to occur during intervals of normal upper pool, and when lower pool is not anticipated to exceed elevation 390.

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-- End of Section --

AMENDMENT #0001

\*\*\*SAFETY PAYS\*\*\*

McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

SECTION TABLE OF CONTENTS

DIVISION 13 - SPECIAL CONSTRUCTION

SECTION 13504

VIBRATING WIRE STRAIN GAUGES/ THERMISTORS

PART 1 GENERAL

- 1.1 REFERENCES
- 1.2 SUBMITTALS
- 1.3 PAYMENT
  - 1.3.1 Furnishing and Installing
  - 1.3.2 Maintenance and Monitoring
- 1.4 DELIVERY, HANDLING, AND STORAGE
- 1.5 WARRANTY

PART 2 PRODUCTS

- 2.1 MATERIALS
  - 2.1.1 Vibrating Wire Strain Gauge/Thermistor
  - 2.1.2 Performance
  - 2.1.3 Cable
  - 2.1.4 Manual Readout Units
- 2.2 FABRICATION
- 2.3 PRE-INSTALLATION TESTING-VIBRATING WIRE STRAIN GAUGES

PART 3 EXECUTION

- 3.1 SITE PREPARATION
- 3.2 INSTALLATION
  - 3.2.1 General Instructions
  - 3.2.2 Attachment
  - 3.2.3 Cable Placement
  - 3.2.4 Cable Splices
  - 3.2.5 Testing
- 3.3 PROTECTION
- 3.4 EXTENSION AND FINAL CONNECTION
- 3.5 POST INSTALLATION TESTING-VIBRATING WIRE GAUGES
- 3.6 FINAL ACCEPTANCE
- 3.7 MANUAL READOUT CALIBRATION

-- End of Section Table of Contents --

## SECTION 13504

## VIBRATING WIRE STRAIN GAUGES/ THERMISTORS

## PART 1 GENERAL

The work covered by this section consists of furnishing all plant, labor, equipment, and materials; and performing all operations required to install and complete the installation of the vibrating wire embedment type strain gauges/thermistors as specified herein.

## 1.1 REFERENCES

EM 1110-2-4300 (NOV 87) Instrumentation for Concrete Structures

Geotechnical Instrumentation for Monitoring Field Performance  
By John Duncliff, 1993, John Wiley & Sons

## 1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. When used, a designation following the "GA" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01335 SUBMITTAL PROCEDURES:

SD-01 Data

Product Data; GA, ED

Within 30 days of the Notice to Proceed, the Contractor shall submit manufacturer's product data to the Contracting Officer for approval, including any requests for consideration of substitutions, as specified herein, together with instruction manuals.

SD-18 Records

Pre Installation Testing; GA, RE

At least 30 workdays prior to any gauge being installed, a pre installation testing report shall be provided to the Contracting Officer. A pre installation testing report shall be provided for each vibrating wire strain gauge/ thermistors, documenting each of the tests in paragraph 2.3, the date the testing was accomplished, and the signatures of the individuals performing the tests and checking the work.

Installation Information, FIO

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

Within 3 workdays of installing each gauge, the Contractor shall submit to the Contracting Officer the installation record sheet for that gauge, including the as-built instrument location, and the post-installation testing report. A post-installation testing report shall be provided for each gauge, documenting each of the tests in Paragraph 3.5, the date the testing was accomplished, and the signatures of the individual performing the tests and checking the work.

Final Gauge Termination; GA, RE

Within 3 workdays of the gauge being connected to the splice cabinet and successfully brought online with the ADAS, a final acceptance report shall be submitted to the Government for approval. A final acceptance report shall be provided for each gauge, documenting each of the tests in Paragraph 3.6, the date the testing was accomplished, and the signatures of the individuals performing the tests and checking the work.

### 1.3 PAYMENT

#### 1.3.1 Furnishing and Installing

Furnishing and installing the gauges specified herein will not be measured for payment. All costs associated with this work shall be included in the lump sum price for "Instrumentation" contained in the Bid Schedule.

#### 1.3.2 Maintenance and Monitoring

Separate payment will not be made for the monitoring and maintenance of the strain gauges specified herein. All costs associated with this work shall be included in the unit price for "Operation & Maintenance of Completed Work (Including Power, Maintenance, Monitoring, and Repair for all Water Control, Instrumentation, and Other Completed Work)" contained in the Bid Schedule. This daily rate shall constitute full compensation for furnishing all labor, equipment, and supplies for monitoring and maintaining the gauges and any equipment relating thereto. Payments based on the daily contract unit price will begin at the beginning of the contract. Payments at the contract unit price will continue to be made for the total balance of the contract period as extended by the Contracting Officer for excusable delays until the lock is complete in accordance with the terms of the contract or as directed by the Contracting Officer. The Contractor shall fully perform but shall not be compensated for any periods of delay determined by the Contracting Officer to be inexcusable. In the event it becomes necessary to flood the cofferdam, a revised unit price per day shall be negotiated with the Contracting Officer for the period between initiation of emergency flooding through the completion of the unwatering process.

### 1.4 DELIVERY, HANDLING, AND STORAGE

All instrumentation materials, after receipt at the site and prior to installation, shall be stored in an indoor, clean, dry, and secure storage space. Instruments shall not be exposed to temperatures outside the manufacturer's stated working temperature range.



## 1.5 WARRANTY

Contractor shall provide to the Government the manufacturer's warranty for the instrument and readout unit within 3 workdays of receipt of the instrument.

## PART 2 PRODUCTS

## 2.1 MATERIALS

## 2.1.1 Vibrating Wire Strain Gauge/Thermistor

Gauges shall be tied to falsework #4 reinforcing bar to ensure proper elevation for conventional concrete monoliths or shall be directly embedded into the RCC lifts during concrete placement. All gauges shall be placed in the horizontal position to measure strains in the lateral direction. The locations of the gauges are shown in Drawings I-3 through I-6.

## 2.1.2 Performance

The vibrating wire strain gauge/thermistor shall be model VCE-4210, as manufactured by Geokon, Inc., Lebanon, NH, or an approved equal. Each strain gauge shall have the following properties: a length of 10 inches, a strain range of 3000 microstrains, sensitivity of 0.4 microstrains, frequency output from 1400 to 3200 HZ, an operating temperature of -20 to 80 degrees Celsius, and shall contain a thermistor readable to 1 degree Fahrenheit.

## 2.1.3 Cable

The cable shall be 6-conductor, 22AWG stranded 7x30, with 3 shielded twisted pairs and a common drain wire. In addition the cable shall be direct-buried cable from the same commercial source as the strain gauges and shall be attached to the strain gauges by the manufacturer of same. Each conductor shall be insulated with either polypropylene or a material guaranteed by the manufacturer of the gauge. The cable shall be 100 percent covered by a metal shield. The outer jacket may be of any of the following materials and shall have a minimum thickness of 0.06 inches: PVC, polypropylene, or polyurethane. Polyethylene shall not be used because sealing of splices to prevent water entry is difficult.

## 2.1.4 Manual Readout Units

The Contractor shall furnish manual readout units for pre-testing and back-up and keep during the entire project. At a minimum, 1 each of the following types of portable readout units shall be required. The readout units shall be manufactured by the same manufacturer of the gauges:

- a) Vibrating wire reader, example Geokon Model GK-403;
- b) circuit tester, example Measurement Group, Inc. Model 1300 gauge installation tester;

c) volt-ohm meter, example Fluke Model 8010A;

## 2.2 FABRICATION

The gauge shall be fabricated and tested by the manufacturer. Other required material shall be supplied by the manufacturer and assembled in accordance with the Drawings and Specifications.

## 2.3 PRE-INSTALLATION TESTING-VIBRATING WIRE STRAIN GAUGES

The pre-installation test shall be made by connecting the gauge to the manual readout unit and while gently pulling on the ends of the gauge observe the reading; it should be seen to increase with increased tension. Excessive tension shall not be applied such as to break the gauge. Gauges broken by testing shall be replaced at the expense of the Contractor. The resistance between the 2 lead wires connected to the coil shall be checked.

It shall be within 10 percent of the nominal coil resistance as stated by the manufacturer. If it is not within 10 percent, a letter shall be obtained from the manufacturer guarantying the gauge. The thermistor shall be checked, with the resistance reading being reduced and compared to the ambient temperature. When performing the resistance-based checks, the nominal resistance of the lead wire shall be subtracted from the measured resistance.

## PART 3 EXECUTION

### 3.1 SITE PREPARATION

The gauges shall be installed at the elevation and monolith location within the mass concrete as indicated on project drawing I-3 through I-6.

### 3.2 INSTALLATION

#### 3.2.1 General Instructions

Installation of the gauges shall be in accordance with the manufacturer's recommendations where not in conflict with these Specifications, EM 1110-2-4300, Geotechnical Instrumentation for Monitoring Field Performance, or the Drawings.

#### 3.2.2 Attachment

The gauges shall be connected with tie wire to #4 reinforcing falsework bars to ensure proper elevation for the conventional concrete monoliths. Each tie wire shall be tight so that the strain gauge does not come loose during the concrete pour. For RCC monoliths, the gauges shall be directly embedded between RCC lifts at the elevation indicated on the drawings. Post-installation tests as stated in Paragraph 3.5 shall be performed before the cable shall be extended.

#### 3.2.3 Cable Placement

The cable shall be extended to the protected splice cabinet as positioned by the Contractor. The cable shall be protected at all times and cable end

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

shall be kept clean and dry at all times. Instrument cable shall be ran in a loose manner as to not overstress or bind during subsequent concrete placement. Post installation tests as stated in Paragraph 3.5 shall be performed.

#### 3.2.4 Cable Splices

Splices shall only be allowed at each monolith splice cabinet, as shown in the ADAS Schematic Drawing. If unplanned splices are required due to damage of the lead wires, the Contractor shall submit a plan for locating the splice to the Contracting Officer (every effort shall be made to place the splice in an area that will be accessible in the future) and the method of splicing shall be in accordance with manufacturers specifications.

#### 3.2.5 Testing

The tests specified in Paragraph 3.5 shall be performed following installation and prior to pouring concrete. If the criteria is not met, the gauge shall be replaced at the sole expense of the Contractor.

#### 3.3 PROTECTION

The Contractor shall use extreme caution and shall provide any means he deems necessary to protect the gauges and cables from damage or disturbance.

#### 3.4 EXTENSION AND FINAL CONNECTION

All cables shall be extended to their respective splice cabinets. Once extended, the cables shall be cut to length and spliced as required by the manufacturer where it shall be brought on-line to the established ADAS system.

#### 3.5 POST INSTALLATION TESTING-VIBRATING WIRE GAUGES

The gauge shall be connected to the splice cabinet and the frequency or strain reading recorded. The resistance between the 2 lead wires connected to the coil shall be read and recorded. It shall be within 10 percent of the value recorded during pre-installation testing. The thermistor shall then be checked, with the resistance reading being reduced and compared to the ambient temperature. The calculated temperature shall be within 2 degrees Fahrenheit of the ambient ground temperature. When performing the resistance-based checks, the nominal resistance of the lead wire shall be subtracted from the measured resistances. The final location of the gauge must be within 6 inches of the proposed location as shown in the drawings. Mislocated gauges must be removed and replaced at the Contractor's expense.

If the gauge does not meet any of the above criteria, the Government's representative shall be notified immediately and the gauge will be accepted only at his option.

#### 3.6 FINAL ACCEPTANCE

Final acceptance testing of the gauge shall be done after the gauge is successfully connected to the ADAS system. The strain reading from the ADAS shall be compared to the strain reading from the manual Readout Box.

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

These readings shall be within 2 micro inches/inch strain of each other. If the gauge-ADAS system does not meet any of the above criteria, the Contracting Officer shall be notified immediately and the system will be accepted only at his option.

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## 3.7 MANUAL READOUT CALIBRATION

The manual readout units shall be calibrated as required. As part of the instrumentation plan, calibration procedures and schedules for the equipment shall be developed based on manufacturer's recommendations and industry practices. All calibration activities shall be reported and documented. All calibrated equipment shall be tagged, noting the company performing calibration, the date of the calibration, and the calibration status. In no case shall uncalibrated, out-of-calibration, or undocumented manual readout equipment be used.

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-- End of Section --

SECTION TABLE OF CONTENTS

DIVISION 13 - SPECIAL CONSTRUCTION

SECTION 13505

PRESSURE CELLS

PART 1 GENERAL

- 1.1 REFERENCES
- 1.2 SUBMITTALS
- 1.3 PAYMENT
  - 1.3.1 Furnishing and Installing
  - 1.3.2 Maintenance and Monitoring
- 1.4 DELIVERY, HANDLING, AND STORAGE
- 1.5 WARRANTY

PART 2 PRODUCTS

- 2.1 MATERIALS
  - 2.1.1 Pressure Cells
  - 2.1.2 Performance
  - 2.1.3 Cable
  - 2.1.4 Manual Readout Units
- 2.2 FABRICATION
- 2.3 PRE-INSTALLATION TESTING-PRESSURE CELLS

PART 3 EXECUTION

- 3.1 SITE PREPARATION
- 3.2 INSTALLATION
  - 3.2.1 General Instructions
  - 3.2.2 Attachment
  - 3.2.3 Cable Placement
  - 3.2.4 Cable Splices
  - 3.2.5 Testing
- 3.3 PROTECTION
- 3.4 EXTENSION AND FINAL CONNECTION
- 3.5 POST INSTALLATION TESTING-Pressure Cells
- 3.6 FINAL ACCEPTANCE
- 3.7 MANUAL READOUT CALIBRATION

-- End of Section Table of Contents --

## SECTION 13505

## PRESSURE CELLS

## PART 1 GENERAL

The work covered by this section consists of furnishing all plant, labor, equipment, and materials; and performing all operations required to install and complete the installation of the pressure cells as specified herein.

## 1.1 REFERENCES

EM 1110-2-4300 (NOV 87) Instrumentation for Concrete Structures

Geotechnical Instrumentation for Monitoring Field Performance  
By John Duncliff, 1993, John Wiley & Sons

## 1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. When used, a designation following the "GA" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01335 SUBMITTAL PROCEDURES:

SD-01 Data

Product Data; GA, ED

Within 30 days of the Notice to Proceed, the Contractor shall submit manufacturer's product data to the Contracting Officer for approval, including any requests for consideration of substitutions, as specified herein, together with instruction manuals.

SD-18 Records

Pre Installation Testing; GA, RE

At least 30 workdays prior to any pressure cell being installed, a pre installation testing report shall be provided to the Contracting Officer. A pre installation testing report shall be provided for each pressure cell, documenting each of the tests in paragraph 2.3, the date the testing was accomplished, and the signatures of the individuals performing the tests and checking the work.

Installation Information, FIO

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

Within 3 workdays of installing each pressure cell, the Contractor shall submit to the Contracting Officer the installation record sheet for each cell, including the as-built instrument location, and the post-installation testing report. A post-installation testing report shall be provided for each cell, documenting each of the tests in Paragraph 3.5, the date the testing was accomplished, and the signatures of the individual performing the tests and checking the work.

Final Gauge Termination; GA, RE

Within 3 workdays of the cell being connected to the splice cabinet and successfully brought online with the ADAS, a final acceptance report shall be submitted to the Government for approval. A final acceptance report shall be provided for each pressure cell, documenting each of the tests in Paragraph 3.6, the date the testing was accomplished, and the signatures of the individuals performing the tests and checking the work.

### 1.3 PAYMENT

#### 1.3.1 Furnishing and Installing

Furnishing and installing the pressure cells specified herein will not be measured for payment. All costs associated with this work shall be included in the lump sum price for "Instrumentation" contained in the Bid Schedule.

#### 1.3.2 Maintenance and Monitoring

Separate payment will not be made for the monitoring and maintenance of the pressure cells specified herein. All costs associated with this work shall be included in the unit price for "Operation & Maintenance of Completed Work (Including Power, Maintenance, Monitoring, and Repair for all Water Control, Instrumentation, and Other Completed Work)" contained in the Bid Schedule. This daily rate shall constitute full compensation for furnishing all labor, equipment, and supplies for monitoring and maintaining the cells and any equipment relating thereto. Payments based on the daily contract unit price will begin at the beginning of the contract. Payments at the contract unit price will continue to be made for the total balance of the contract period as extended by the Contracting Officer for excusable delays until the lock is complete in accordance with the terms of the contract or as directed by the Contracting Officer. The Contractor shall fully perform but shall not be compensated for any periods of delay determined by the Contracting Officer to be inexcusable. In the event it becomes necessary to flood the cofferdam, a revised unit price per day shall be negotiated with the Contracting Officer for the period between initiation of emergency flooding through the completion of the unwatering process.

### 1.4 DELIVERY, HANDLING, AND STORAGE

All instrumentation materials, after receipt at the site and prior to installation, shall be stored in an indoor, clean, dry, and secure storage space. Instruments shall not be exposed to temperatures outside the manufacturer's stated working temperature range.

## 1.5 WARRANTY

Contractor shall provide to the Government the manufacturer's warranty for the instrument and readout unit within 3 workdays of receipt of the instrument.

## PART 2 PRODUCTS

### 2.1 MATERIALS

#### 2.1.1 Pressure Cells

The pressure cell shall be model 4810 "Fat Back" Pressure Cell, as manufactured by Geokon, Inc., Lebanon, NH, or an approved equal.

#### 2.1.2 Performance

Each pressure cell shall have the following properties: a diameter of 9 inches, a pressure range of 100 pounds per square inch, sensitivity of 0.1 pounds per square inch, frequency output from 1400 to 3200 HZ.

#### 2.1.3 Cable

The cable shall be 6-conductor, 22AWG stranded 7x30, with 3 shielded twisted pairs and a common drain wire. In addition the cable shall be direct-buried cable from the same commercial source as the pressure cells and shall be attached to the pressure cells by the manufacturer of same. Each conductor shall be insulated with either polypropylene or a material guaranteed by the manufacturer of the cell. The cable shall be 100 percent covered by a metal shield. The outer jacket may be of any of the following materials and shall have a minimum thickness of 0.06 inches: PVC, polypropylene, and polyurethane. Polyethylene shall not be used because sealing of splices to prevent water entry is difficult.

#### 2.1.4 Manual Readout Units

The Contractor shall furnish manual readout units and keep during the entire project. At a minimum, 1 each of the following types of portable readout units shall be required. The readout units shall be manufactured by the same manufacturer of the cells:

- a) Vibrating wire reader, example Geokon Model GK-403;
- b) circuit tester, example Measurement Group, Inc. Model 1300 gauge installation tester;
- c) volt-ohm meter, example Fluke Model 8010A;

### 2.2 FABRICATION

The pressure cells shall be fabricated and tested by the manufacturer. Other required material shall be supplied by the manufacturer and assembled in accordance with the Drawings and Specifications.



## 2.3 PRE-INSTALLATION TESTING-PRESSURE CELLS

The pre-installation test shall be made by connecting the pressure cell to the manual readout unit and while gently pushing on the center of the pressure cell observe the reading; it should be seen to increase with increased pressure. Excessive pressure shall not be applied such as to break the pressure cell. Pressure cells broken by testing shall be replaced at the expense of the Contractor. The resistance between the 2 lead wires connected to the coil shall be checked. It shall be within 10 percent of the nominal coil resistance as stated by the manufacturer. If it is not within 10 percent, a letter shall be obtained from the manufacturer guaranteeing the pressure cell. When performing the resistance-based checks, the nominal resistance of the lead wire shall be subtracted from the measured resistance.

## PART 3 EXECUTION

### 3.1 SITE PREPARATION

The pressure cells shall be installed on an even surface with anchor bolts at the elevation and monolith location as indicated on project drawings I-3 through I-6.

### 3.2 INSTALLATION

#### 3.2.1 General Instructions

Installation of the pressure cells shall be in accordance with the manufacturer's recommendations where not in conflict with these Specifications, EM 1110-2-4300, Geotechnical Instrumentation for Monitoring Field Performance, or the Drawings.

#### 3.2.2 Attachment

The pressure cells shall be placed on an even surface and connected with anchor bolts in accordance with the manufacturer's recommendations. Post-installation tests as stated in Paragraph 3.5 shall be performed before the cable shall be extended.

#### 3.2.3 Cable Placement

The cable shall be extended to the protected splice cabinet as positioned by the Contractor. The cable shall be protected at all times and cable end shall be kept clean and dry at all times. Post installation tests as stated in Paragraph 3.5 shall be performed.

#### 3.2.4 Cable Splices

Splices shall only be allowed at each monolith splice cabinet, as shown in the ADAS Schematic Drawing. If unplanned splices are required due to damage of the lead wires, the Contractor shall submit a plan for locating the splice to the Contracting Officer (every effort shall be made to place the splice in an area that will be accessible in the future) and the method

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

of splicing shall be in accordance with manufacturers specifications.

### 3.2.5 Testing

The tests specified in Paragraph 3.5 shall be performed following installation and prior to backfilling. If the criteria is not met, the pressure cell shall be replaced at the sole expense of the Contractor.

### 3.3 PROTECTION

The Contractor shall use extreme caution and shall provide any means he deems necessary to protect the cells and cables from damage or disturbance.

### 3.4 EXTENSION AND FINAL CONNECTION

All cables shall be extended to their respective splice cabinets. Once extended, the cables shall be cut to length and spliced as required by the manufacturer where it shall be brought on-line to the established ADAS system.

### 3.5 POST INSTALLATION TESTING-Pressure Cells

The pressure cells shall be connected to the splice cabinet and the frequency or pressure reading recorded. The resistance between the 2 lead wires connected to the coil shall be read and recorded. It shall be within 10 percent of the value recorded during pre-installation testing. When performing the resistance-based checks, the nominal resistance of the lead wire shall be subtracted from the measured resistances. The final location of the cell must be within 6 inches of the proposed location as shown in the drawings. Mislocated cells must be removed and replaced at the Contractor's expense. If the cell does not meet any of the above criteria, the Contracting Officer shall be notified immediately and the cell will be accepted only at his option.

### 3.6 FINAL ACCEPTANCE

Final acceptance testing of the pressure cells shall be done after the pressure cells are successfully connected to the ADAS system. The pressure reading from the ADAS shall be compared to the pressure reading from the manual Readout Box. These readings shall be within 0.1 pounds per square inch of each other. If the cell-ADAS system does not meet any of the above criteria, the Contracting Officer shall be notified immediately and the system will be accepted only at his option.

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### 3.7 MANUAL READOUT CALIBRATION

The manual readout units shall be calibrated as required. As part of the instrumentation plan, calibration procedures and schedules for the equipment shall be developed based on manufacturer's recommendations and industry practices. All calibration activities shall be reported and documented. All calibrated equipment shall be tagged, noting the company performing calibration, the date of the calibration, and the calibration status. In no case shall uncalibrated, out-of-calibration, or undocumented

AMENDMENT #0001

\*\*\*SAFETY PAYS\*\*\*

McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

**manual readout equipment be used.**

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-- End of Section --

SECTION TABLE OF CONTENTS

DIVISION 13 - SPECIAL CONSTRUCTION

13532

LOAD CELLS MOUNTED ON PRESTRESSED ANCHORS

PART 1 GENERAL

- 1.1 MEASUREMENT AND PAYMENT
  - 1.1.1 Furnishing and Installing
  - 1.1.2 Maintenance and Monitoring
- 1.2 DELIVERY, STORAGE, AND HANDLING
- 1.3 WARRANTY
- 1.4 SUBMITTALS

PART 2 PRODUCTS

- 2.1 LOAD CELLS
- 2.2 SIGNAL CABLES
- 2.3 MANUAL READOUT BOX
  - 2.3.1 Readout Box and Accessories

PART 3 EXECUTION

- 3.1 INSTALLATION
- 3.2 DATA COLLECTION
- 3.3 DATA HANDLING
- 3.4 MANUAL READOUT CALIBRATION

-- End of Section Table of Contents --

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13532

## LOAD CELLS MOUNTED ON PRESTRESSED ANCHORS

## PART 1 GENERAL

The work covered by this section consists of furnishing all plant, labor, equipment, and materials; and performing all operations required to install new load cells at monoliths M31 and M32 of the existing lock, to maintain and monitor load cells on the prestressed anchors in the 600' lock south wall and the 1200' lock middle wall and to install access to anchors to be buried on the south 600' lock south wall. The Contractor shall also provide and maintain all instruments and equipment necessary to take readings.

## 1.1 MEASUREMENT AND PAYMENT

## 1.1.1 Furnishing and Installing

Furnishing and installing Load cells mounted on prestressed Anchors will not be measured for payment. All costs associated with this work shall be included in the lump sum price for "Instrumentation" contained in the bid schedule.

## 1.1.2 Maintenance and Monitoring

Separate payment will not be made for the monitoring and maintenance of the load cells mounted on prestressed anchors specified herein. All costs associated with this work shall be included in the unit price for "Operation & Maintenance of Completed Work (Including Power, Maintenance, Monitoring and Repair for all Water Control, Instrumentation, and Other Work)" contained in the bid schedule. This daily rate shall constitute full compensation for furnishing all labor, equipment, and supplies for monitoring and maintaining the load cells mounted on rock anchors and any equipment related thereto. Payments based on the daily contract unit price. Payments at the contract unit price will continue to be made for the total balance of the contract period as extended by the Contracting Officer for excusable delays until the lock construction is complete in accordance with the terms of the contract or as directed by the Contracting Officer.

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

The Contractor shall fully perform but shall not be compensated for any periods of delay determined by the Contracting Officer to be inexcusable. In the event it becomes necessary to flood the cofferdam, a revised unit price per day shall be negotiated with the Contracting Officer for the period between initiation of emergency flooding through the completion of the unwatering process.

## 1.2 DELIVERY, STORAGE, AND HANDLING

All materials shall be received at the site undamaged and shall be stored in a clean, safe area; protected from the weather and contamination.

Any materials damaged by mishandling will be rejected by the Government for use and shall be replaced at the Contractor's expense.

## 1.3 WARRANTY

The Contractor shall provide to the Government the manufacturer's warranty for each instrument and readout unit within 2 workdays of receipt of the instrument.

## 1.4 SUBMITTALS

Government approval is required for all submittals with a "GA" designation; submittals having an "FIO" designation are for information only. When used, a designation following the "GA" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01335

SUBMITTAL  
PROCEDURES:

## SD-01 Data

Product Data; GA, ED

Within 30 work days of the Notice to Proceed, the Contractor shall submit the Instrumentation Plan with manufacturer's product data to the Government for approval, including any requests for consideration of substitutions, as specified herein, together with instruction manuals.

## SD-04 Drawings

Work Plan; GA, ED

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

Prior to the installation of any load cells, the Contractor shall submit for approval of the Contracting Officer drawings and documents which completely describe the proposed loads cells and the proposed methods for: installation; protecting and maintaining load cells, instrument observations; data reduction; and data reporting. These drawings and documents shall include shop drawings of the load cells, reading equipment, manufacturer's catalog data, operator's installation instructions, and a description of handling and storage methods. Load cells, accessories, associated parts and materials shall be identified as applicable, by stock numbers, standard nomenclature, performance rating and conformance with technical standards. Prior to installation, the Contractor shall consolidate these drawings and documents into manual form and submit five copies to the Contracting Officer. Any additions, deletions, or deviations from the manufacturer's procedures, equipment, or materials shall be identified, approved by the Contracting Officer, and described in writing in the above noted manual.

## SD-09 Reports

Installation Reports; FIO.

Within 5 workdays of each load cell installation, the Contractor shall submit to the Government and installation record sheet and post-installation testing report. The installation record sheet shall include date of load cell installation, location of anchor where load cell was installed, and type of load cell installed.

## PART 2 PRODUCTS

Materials and equipment shall conform to the requirements indicated on the Drawings or referred to herein, and when not covered thereby, materials and equipment of the best commercial grade quality suited to the intended use and as approved by the Contracting Officer shall be furnished. All load cell materials shall be from the same manufacturer.

## 2.1 LOAD CELLS

Load cells shall consist of vibrating-wire strain gauges. Each load cell shall be equipped with a minimum of 6 strain gauges located on the perimeter, and the individual readings shall be

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

averaged to minimize the effect of uneven and eccentric loading. The load cells shall have an inside diameter large enough to accommodate the anchor strands; and shall have a rated capacity equal to the anchor capacity plus an overload capacity of 50 percent, F.S., and the operating temperature range shall be approximately 40C to 75C. The load cells shall have a sensitivity of 0.01 percent, F.S., and an accuracy of 0.5 percent, F.S. Vibrating-wire, strain-gauge load cells shall be 4900-series load cells as manufactured by Geokon, Inc. 48 Spencer Street, Lebanon, New Hampshire 03766, or approved equal.

## 2.2 SIGNAL CABLES

Signal cables shall be compatible with the type of load cell selected for use. The cables shall have individually shielded pairs of conductors and shall be suitable for direct burial. Each cable shall have sufficient length at both ends to allow easy connections. Splices shall be made only here absolutely necessary and shall be watertight. Each cable shall be marked at both ends with a number and the load cell location. The cable shall be as manufactured by Belden Wire and Cable Company, Richmond, Indiana, or equal.

## 2.3 MANUAL READOUT BOX

The Manual Readout Box used to make the initial readings and to make subsequent manual readings for the vibrating-wire strain-gauge load cells shall be Model No. GK-403 as manufactured by Geokon, Inc., or approved equal.

## 2.3.1 Readout Box and Accessories

All manual readout devices, data loggers, and accessory devices used to read the load cells during construction shall be available for use by the Contracting Officer at all times and shall become Government property at the conclusion of the contract. The Contractor shall maintain all devices in working condition until they are turned over to the Government.

## PART 3 EXECUTION

## 3.1 INSTALLATION



## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

A center-hole load cell shall be installed between the bearing plate and the wedge block of each anchor to be monitored. A strand equalizer shall be used to apply a uniform loading to each cell. If a load cell becomes inoperative, the Contracting Officer shall determine when, or if, the cell will be replaced. In addition the load cells shall be installed in such a manner that readings can be taken manually with a portable readout unit.

### 3.2 DATA COLLECTION

Manual readings shall be taken on the load cells in accordance with specification section 13500 INSTRUMENTATION. The ambient temperature at the load cell locations shall be recorded at the time of the load cell measurement.

### 3.3 DATA HANDLING

Load cell data shall be recorded and reduced to standard units of measure at the project site. All manually read data shall be reduced and prepared in a consistent report format for use by the District Office and the Contracting Officer within 24 hours of collection. Data shall be summarized in a daily report furnished to the Contracting Officer. Each daily report shall highlight any significant changes in measured values, and will highlight what construction or environmental changes occurred which could have produced the changes in values. In addition, monthly reports shall be prepared with the load cell data plotted graphically. Load cell data shall be reduced to total load and plotted versus time.

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### 3.4 MANUAL READOUT CALIBRATION

The manual readout box shall be calibrated as required. As part of the instrumentation plan, calibration procedures and schedules for equipment shall be developed based on manufacturer's recommendations and industry practices. All calibration activities shall be reported and documented. All calibrated equipment shall be tagged, noting the company performing calibration, the date of calibration, and the calibration status. In no case shall uncalibrated, out of calibration, or undocumented manual readout equipment be used.

AMENDMENT #0001

\*\*\*SAFETY PAYS\*\*\*

McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

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-- End of Section --

SECTION TABLE OF CONTENTS

DIVISION 15 - MECHANICAL

SECTION 15010

HYDRAULIC POWER SYSTEMS FOR CIVIL WORKS STRUCTURES

04/92

PART 1 GENERAL

- 1.1 REFERENCES
- 1.2 PAYMENT
- 1.3 SYSTEM DESCRIPTION
- 1.4 SUBMITTALS
- 1.5 DESIGN AND PERFORMANCE REQUIREMENTS
  - 1.5.1 General
  - 1.5.2 Design Parameters
  - 1.5.3 Allowable Stresses
  - 1.5.4 Connections
    - 1.5.4.1 Pinned Connections
    - 1.5.4.2 Shop Connections
    - 1.5.4.3 Metal Work Fabrication and Welded Connections
- 1.6 DELIVERY, STORAGE, AND HANDLING
  - 1.6.1 Packaging
  - 1.6.2 Shipping, Preservation, and Storage
- 1.7 PROJECT/SITE CONDITIONS
- 1.8 WARRANTY
- 1.9 OPERATION AND MAINTENANCE INSTRUCTIONS
- 1.10 SCHEMATIC AND DRAWINGS
  - 1.10.1 Preliminary Drawings
  - 1.10.2 Shop Drawings
  - 1.10.3 Fabrication Drawings
  - 1.10.4 Shop Assembly Drawings
  - 1.10.5 Hydraulic Schematic
  - 1.10.6 Delivery Drawings
  - 1.10.7 Field Installation Procedures

PART 2 PRODUCTS

- 2.1 HYDRAULIC POWER SYSTEM COMPONENTS
  - 2.1.1 General
  - 2.1.2 Standard Products
  - 2.1.3 Hydraulic Cylinders
    - 2.1.3.1 Cylinder Tubes
    - 2.1.3.2 Cylinder Rods
    - 2.1.3.3 Position Indicators
    - 2.1.3.4 Miscellaneous Cylinder Components
    - 2.1.3.5 Mounts, Connections and Bearings
  - 2.1.4 Hydraulic Power Units

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

- 2.1.4.1 Fluid Reservoirs
- 2.1.4.2 Reservoir Manifolds
- 2.1.4.3 Reservoir Heater
- 2.1.4.4 Flexible Breather
- 2.1.4.5 Pumps
- 2.1.4.6 Pump Pressure Relief Valves
- 2.1.4.7 Motors
- 2.1.4.8 Kidney Loop Filter Circuit
- 2.1.4.9 Return Line Filter
- 2.1.4.10 Thermometer
- 2.1.4.11 Temperature Transducer
- 2.1.4.12 Fluid Level Float Switches
- 2.1.4.13 Differential Pressure Switch
- 2.1.4.14 Gauges
- 2.1.4.15 Control Console
- 2.1.4.16 Nameplates and Instruction Plates
- 2.1.4.17 Security Provisions
- 2.1.5 Pressure Gauges
- 2.1.6 Pressure Transducer and Transmitter
- 2.1.7 Pressure Snubber
- 2.1.8 Manifolds
- 2.1.9 Valves
  - 2.1.9.1 Ball Valves
  - 2.1.9.2 Control Valves
  - 2.1.9.3 Pressure Relief Valves
  - 2.1.9.4 Check Valves
  - 2.1.9.5 Counterbalance Valves
  - 2.1.9.6 Air Bleed Valves
- 2.1.10 Power Piping
  - 2.1.10.1 Stainless Steel Pipe
  - 2.1.10.2 Pipe Fittings
  - 2.1.10.3 Hydraulic Tubing
  - 2.1.10.4 Tube Fittings
  - 2.1.10.5 Flexible Hydraulic Hose
- 2.1.11 Bolts, Nuts, and Washers
  - 2.1.11.1 Structural Bolted Connections
  - 2.1.11.2 Stainless Steel Bolts, Nuts and Washers
- 2.1.12 Hydraulic Fluid
- 2.1.13 Portable Filtering System
- 2.2 ELECTRICAL EQUIPMENT
  - 2.2.1 General
  - 2.2.2 Conduit, Duct, and Accessories
    - 2.2.2.1 Conduit and Cabinet Supports
  - 2.2.3 Cabinets and Boxes
  - 2.2.4 Control Components
    - 2.2.4.1 Control Devices and Wiring
    - 2.2.4.2 Electronic Limit Switches
    - 2.2.4.3 Manual Switches
    - 2.2.4.4 Relays
    - 2.2.4.5 Indicating Lights
- 2.3 SPARE PARTS

## PART 3 EXECUTION

McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

- 3.1 SHOP ASSEMBLY AND TESTING
  - 3.1.1 Cleaning
  - 3.1.2 Cylinder Tests
  - 3.1.3 Hydraulic Power Unit Testing
- 3.2 INSTALLATION
  - 3.2.1 General
  - 3.2.2 Cleaning and Flushing the System
  - 3.2.3 Filling and Bleeding the System
- 3.3 PAINTING
- 3.4 FIELD TESTS AND INSPECTIONS
  - 3.4.1 Field Testing
  - 3.4.2 Proof Testing
  - 3.4.3 Final Acceptance Tests
    - 3.4.3.1 Initial Start-Up
    - 3.4.3.2 Combined System Tests
    - 3.4.3.3 Test Reports
- 3.5 ERECTION ENGINEER

-- End of Section Table of Contents --

## SECTION 15010

## HYDRAULIC POWER SYSTEMS FOR CIVIL WORKS STRUCTURES

04/92

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

## AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI 70	(2002) National Electrical Code
ANSI T2.24.1	(2000) Hydraulic Fluid Power - Systems Standard for Stationary Industrial Machinery First Edition
ANSI T3.16.2 R1	(1997) Hydraulic Fluid Power - Design for Nonintegral Industrial Reservoirs
ANSI T3.16.3	(1997; R1) Hydraulic Fluid Power - Requirements for Nonintegral Industrial Power Units
ANSI B93.7	(1986M) HYDRAULIC FLUID POWER - VALVES - MOUNTING INTERFACES

## AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 182/A 182M	(2001) Forged or Rolled Alloy-Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High-Temperature Service
ASTM A 193/A 193M	(2001a) Alloy-Steel and Stainless Steel Bolting Materials For High-Temperature Service
ASTM A 194/A 194M	(2001a) Carbon and Alloy Steel Nuts for Bolts For High-Pressure and High-Temperature Service
ASTM A 312/A 312M	(2001) Seamless and Welded Austenitic Stainless Steel Pipes
ASTM A 325	(2001) Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength

ASTM A 563	(2000) STANDARD SPECIFICATION FOR CARBON AND ALLOY STEEL NUTS
ASTM A 564/A 564M	(2001) Hot-Rolled and Cold-Finished Age-Hardening Stainless Steel Bars and Shapes
ASTM A 659/A 659M	(1997) Steel, Carbon (0.16 Maximum to 0.25 Maximum Percent), Hot-Rolled Sheet and Strip, Commercial Quality
ASTM A 789/A 789M	(2001a) Seamless and Welded Ferritic/Austenitic Stainless Steel Tubing for General Service
ASTM B 177	(2001) Chromium Electroplating on Steel for Engineering Use
<b>*1</b>	
<b>ASTM D 92</b>	<b>(2001) STANDARD TEST METHOD FOR FLASH AND FIRE POINTS BY CLEVELAND OPEN CUP</b>
<b>ASTM D 97</b>	<b>(1996a) STANDARD TEST METHOD FOR POUR POINT OF PETROLEUM PRODUCTS</b>
<b>ASTM D 665</b>	<b>(1999) TEST METHOD FOR RUST-PREVENTION CHARACTERISTICS OF INHIBITED MINERAL OIL IN THE PRESENCE OF WATER</b>
<b>ASTM D 892</b>	<b>(2001) STANDARD TEST METHOD FOR FOAMING CHARACTERISTICS OF LUBRICATING OILS</b>
<b>ASTM D 943</b>	<b>(1999) STANDARD TEST METHOD FOR OXIDATION CHARACTERISTICS OF INHIBITED MINERAL OILS</b>
<b>ASTM D 1401</b>	<b>(1998) STANDARD TEST METHOD FOR WATER SEPARABILITY OF PETROLEUM OILS AND SYNTHETIC FLUIDS</b>
	<b>*1</b>
ASTM D 3951	(1998) Commercial Packaging
ASTM F 436	(1993) STANDARD SPECIFICATION FOR HARDENED STEEL WASHERS
ASTM F 844	(2000) Washers, Steel, Plain (Flat), Unhardened for General Use
ASTM G 85	(1998) Modified Salt Spray (Fog) Testing

ASME INTERNATIONAL (ASME)

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

ASME B16.11	(1996) Forged Fittings, Socket-Welding and Threaded
ASME B31.1	(1998; R 2000) Power Piping
ASME B36.19M	(1985; R 1994) Stainless Steel Pipe
ASME B40.100	(1998) Pressure Gauges And Gauge Attachments
ASME BPV VIII Div 1	(1998) Boiler and Pressure Vessel Code; Section VIII, Pressure Vessels Division 1 - Base Coverage
ASME Y32.10	(1967; R 1994) Graphical Symbols for Fluid Power Diagrams

## INTERNATIONAL ELECTROTECHNICAL COMMISSION

IEC 60529	DEGREES OF PROTECTION PROVIDED BY ENCLOSURES (IP CODE)
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## INTERNATIONAL ORGANIZATION FOT STANDARDIZATION

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ISO 1219	(1991) FLUID POWER SYSTEMS AND COMPONENTS - GRAPHIC SYMBOLS AND CIRCUIT DIAGRAMS
ISO 2941	(1974) HYDRAULIC FLUID POWER - FILTER ELEMENTS - VERIFICATION OF COLLAPSE/BURST RESISTANCE
ISO 2942	(1994) HYDRAULIC FLUID POWER - FILTER ELEMENTS - VERIFICATION OF FABRICATION INTEGRITY AND DETERMINATION OF THE FIRST BUBBLE POINT
ISO 2943	(1998)HYDRAULIC FLUID POWER - FILTER ELEMENTS - VERIFICATION OF MATERIAL COMPATIBILITY WITH FLUIDS
ISO 4406	HYDRAULIC FLUID POWER - FLUIDS - METHOD FOR CODING
ISO 4572	(1981) HYDRAULIC FLUID POWER-FILTERS-MULTI-PASS METHOD

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## NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA ICS 1	(2001) Industrial Control and Systems
NEMA ICS 2	(2000) Industrial Control and Systems Controllers, Contactors, and Overhead Relays Rated Not More Than 2000 Volts AC



## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

or 750 Volts DC

NEMA ICS 6

(1993) Industrial Control and Systems  
Enclosures

## NATIONAL FLUID POWER ASSOCIATION (NFPA)

NFPA B93.19M

(1972; R 1993) Hydraulic Fluid Power -  
Particulate Contamination Analysis -  
Extraction of Fluid Samples from Lines of  
an Operating System

## SOCIETY OF AUTOMOTIVE ENGINEERS (SAE)

SAE ARP 598B

(1986; R 1991) Determination of  
Particulate Contamination in Liquids by  
the Particle Count Method

SAE J518

(1993) HYDRAULIC FLANGED TUBE, PIPE, AND  
HOSE CONNECTIONS, FOUR-BOLT SPLIT FLANGE  
TYPE

SAE J1453

FITTING - O-RING FACE SEAL

SAE J1926/1

(1993) CONNECTIONS FOR GENERAL USE AND  
FLUID POWER-PORTS AND STUD ENDS WITH ISO  
725 THREADS AND O-RING SEALING - PART 1:  
THREADED PORT WITH O-RING SEAL IN  
TRUNCATED HOUSING

## UNDERWRITERS LABORATORIES (UL)

UL 50

(1995; Rev Aug 1997) Enclosures for  
Electrical Equipment

## 1.2 PAYMENT

Payment will be made for costs associated with the complete hydraulic power system as specified herein. Payment shall be made for bid item "Hydraulic Power System".

## 1.3 SYSTEM DESCRIPTION

**\*1**

The work covered by this section of the specifications consists of detailed requirements for the design, fabrication, shop assembly, testing, delivery, storage and installation of fully functioning hydraulic power system for operation of the **culvert (filling and emptying)** valves, miter **gate leaves**, and miter gate latches as shown in the contract drawings. Basic components of the **hydraulic power system** include hydraulic power units, hydraulic cylinders, control valving and valve manifolds as specified herein and shown on the contract drawings. **The following appurtenant items shall be provided as specified herein, to produce the hydraulic power system: All**

hydraulic power piping, fittings, valves and hoses; Electrical enclosures, conduits, wiring, etc. to connect the basic hydraulic components to the PLC and Manual Control Systems; Pressure transducers and transmitters, pressure gauges and pressure snubbers; Hydraulic fluid; Portable filtering system; Pipe hangers, miscellaneous nuts and bolts; Spare parts as identified herein; Any additional items not identified but required for the proper function of the selected hydraulic components. The Prime Contractor shall be responsible for the coordination and communication between electrical, mechanical, controls and hydraulic equipment sub-contractors.

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#### 1.4 SUBMITTALS

All dimensions and ratings for submittals shall be given in United States Customary System (USCS) of units. Submittals not using USCS will not be approved. Submittals made that reference standards other than those listed in the paragraph titled "REFERENCES" will not be approved. Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01335 SUBMITTAL PROCEDURES:

##### SD-01 Data

HYDRAULIC POWER SYSTEM COMPONENTS; GA, ED. Electrical Equipment; GA, ED.

Submit manufacturer's catalog data and descriptive literature for all standard equipment and products to be incorporated in the work, including all materials and equipment specified in paragraphs HYDRAULIC POWER SYSTEM COMPONENTS and ELECTRICAL EQUIPMENT. This data shall include specifications and assembly drawings showing sizes, ratings, parts and material lists, overall dimensions, and mounting dimensions.

System Description; GA, ED. Design and Performance Requirements; GA, ED.

Submit system description and design computations for all items which are to be designed by the Contractor.

Shop Assembly and Testing; GA, ED.

Submit procedures for shop testing for all testing outlined in paragraph SHOP ASSEMBLY AND TESTING.

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Cleaning and Flushing **Procedure**; GA, ED.

\*1

Submit procedures for field cleaning and flushing as outlined in paragraph CLEANING AND FLUSHING THE SYSTEM. Submit a detailed field cleaning procedure not less than 30 days before start of cleaning operations.

Field Testing; GA, ED.

Submit procedures for field testing as specified in paragraph FIELD TESTING. Submit proposed testing program at least 4 weeks prior to the first scheduled test to ensure agreement as to personnel required and scope of the testing program.

## SD-04 Drawings

Schematic and Drawings; GA, ED.

Submit schematic and drawings as specified.

## SD-09 Reports

Shop Tests; GA, ED. Field Tests; GA, ED.

Submit operational test reports for all required shop testing and testing of the equipment after installation.

Piston Rods; GA, ED.

Submit certified test report of the corrosion resistant test on ceramic coating as specified in paragraph(s) CYLINDER RODS .

## SD-19 Operation and Maintenance Manuals

Operation and Maintenance; GA, ED.

Operation and maintenance manuals shall be furnished in accordance with Section 01800.

## 1.5 DESIGN AND PERFORMANCE REQUIREMENTS

## 1.5.1 General

**\*1**

The contract drawings indicate the arrangement of the hydraulic power system for operating the culvert (filling and emptying) valves, miter gates and miter gate latches . The contract drawings show routing of piping for the hydraulic power system and the clearances necessitated by the structure or other equipment, maximum overall dimensions, and other pertinent features. **The hydraulic power system shall be designed in conformance with ANSI T2.24.1, and the following criteria.**

**\*1**

## 1.5.2 Design Parameters

**\*1**

The hydraulic power system shall consist of four hydraulic power units, four miter gate cylinders, four culvert valve cylinders, **eight** miter gate latch cylinders, various valve manifolds and control valves plus spare parts as identified herein. Each hydraulic power unit shall operate one miter gate leaf and two **miter** gate latches. Hydraulic power units in control buildings "A" and "B" shall additionally operate one culvert (filling) valve each. Hydraulic power unit in control building "C" shall additionally operate two culvert (emptying) valves. Drawing M-31 in the contract plans show functions and basic features required of the hydraulic power system. The hydraulic power system shall be capable of operating at 3000 psi. The system shall also be capable of withstanding intermittent pressure spikes of up to 5000 psi.

Drawings M-22 through M-28 show the hydraulic actuators required for the project. The contractor is required to design and supply all mountings,

brackets, bearings, etc., shown and not shown, to completely install the **approved hydraulic equipment**. Actuators, **Hydraulic** Power Units and **Valve** Manifolds shall fit in the space constraints shown in the contract plans. Hydraulic cylinders shall be able to withstand submergence in the river as follows. Culvert valve cylinders shall be capable of operating when submerged to a depth of 18 feet without the intrusion of water. Culvert valve cylinders shall prevent the intrusion of water to a depth of 35 feet when not operating. Miter gate cylinders shall be capable of operating when submerged to a depth of 3 feet without the intrusion of water. Miter gate cylinders shall prevent the intrusion of water to a depth of 23 feet when not operating. Miter gate latch cylinders shall be capable of operating when submerged to a depth of 9 feet without the intrusion of water. Miter gate latch cylinders shall prevent the intrusion of water to a depth of 26 feet when not operating.

Hydraulic power system shall be capable of functioning under two separate control systems, PLC (semi-automatic) System and Hard Wired Backup (manual) System, as specified herein and Section 16900 CONTROL AND INSTRUMENTATION, and shown on the contract plans. The hydraulic power system will cycle as described in Section 16900 CONTROL AND INSTRUMENTATION. Complete operating parameters are tabulated on sheets M-24 and M-25, and noted on M-31 in the contract drawings. The hydraulic system shall be capable of continuously **reporting fluid pressure**, temperature, and actuator position to the control systems. The hydraulic system shall be capable of reporting alarm conditions for fluid level, **high fluid pressure, high fluid temperature and contaminated** filter. The principal design parameters for the hydraulic power system are as follows:

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a. Miter Gate Leaf: Hydraulic system, when signaled by either control system shall be capable of opening a miter gate leaf against a 202 kip load and closing the gate leaf against a 195 kip load. The hydraulic system shall be capable of holding a miter gate leaf in place when experiencing loads between 202 kips and 387 kips. When a miter gate leaf is loaded in excess of 387 kips the hydraulic system shall allow it to move until the force on the leaf decreases below 387 kips. Between periods of operation, the hydraulic system shall lock the leaf in position as follows. The miter gate leaf shall not drift from its point of rest unless a force in excess of 387 kips is applied to the gate leaf. If a force in **excess** of 387 kips is applied to **a gate leaf**, the hydraulic system shall **allow** it to move until the force on the leaf decreases below 387 kips.

1. PLC Control: The hydraulic system, when controlled by the PLC system, shall operate as follows. The hydraulic system shall accelerate the miter gate leaf from the recess position (open) or the miter position (closed) at a constant rate until the hydraulic cylinder has stroked a distance of 0.96 feet. At that point the hydraulic cylinder shall extend or retract at a constant velocity for 15.31 feet. When the cylinder reaches 16.27 feet of stroke, the hydraulic system shall decelerate the the hydraulic cylinder at a constant rate until the cylinder reaches the end of its stroke. Operating speeds will vary depending on the upper and

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

lower pool elevations. Charts on sheet M-25 tabulates operating cycles at normal and maximum pool elevations.

2. Hard Wired Backup Control: The hydraulic system, when controlled manually (Hard Wired Backup Control), shall operate as follows. The operator shall have a choice of two speeds and direction for the hydraulic cylinder. The hydraulic cylinder shall extend or retract in response to the operators command. The hydraulic cylinder shall open or close the miter gate leaf at either high (5 feet/min) speed or low (2.5 feet/min) speed in response to the operators command. The stated operating speeds are for normal operating pool elevations and miter gate submergence; Upstream miter gate, normal pool el. 420, submergence 53 feet, Downstream miter gate, normal pool el. 383, submergence 16 feet. At higher pool elevations operating speeds shall decrease due to increased loading on the miter gates.

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b. Culvert (Filling/Emptying) Valve: Hydraulic system, when signaled by either control system, shall be capable of opening either one or two culvert valve(s) against a 100 kip load. The hydraulic system shall be capable of holding a culvert valve in a raised position without drifting down.

1. PLC Controlled: The hydraulic system, when controlled by the PLC system, shall operate as shown on sheet M-24 in the contract drawings.

2. Hard Wired Backup Controlled: The hydraulic system, when controlled manually, shall operate as follows. The operator shall have the choice of direction for the hydraulic cylinder. The hydraulic cylinder shall extend or retract in response to the operators command. The hydraulic cylinder shall open or close the culvert valve at 2 feet/min.

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c. Miter Gate Latches: Hydraulic system, when signaled by either control system, shall be capable of raising or lowering miter gate latches. Gate latches shall fully stroke in one direction in 4 seconds. The hydraulic system shall be capable of holding the miter gate latches in the up position without latches drifting down.

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### 1.5.3 Allowable Stresses

The hydraulic cylinders, including trunnions, cardanic ring, clevis connection, mountings and brackets shall be designed to withstand the maximum operating pressure in the system with a factor of safety of 5 based on the ultimate strength of the material for normal operating conditions. Allowable stress for overload conditions shall be 75 percent of the yield strength of the material. A factor of safety of 2.5 shall be applied to the compression load when designing the hydraulic cylinders to resist buckling. Stress concentration factors shall be used where applicable. Reduction of allowable stresses to compensate for repeated cycles of loading is not required.

## 1.5.4 Connections

## 1.5.4.1 Pinned Connections

Pinned hydraulic cylinder connections for field assembly shall be designed as shown in the contract drawings.

## 1.5.4.2 Shop Connections

Shop connections shall be designed for assembly by means of welding or by bolting.

## 1.5.4.3 Metal Work Fabrication and Welded Connections

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**Design of metalwork fabrication and their welded connections, other than pressure vessels and pressure piping, shall be in accordance Section 05055 METALWORK FABRICATION, MACHINE WORK, AND MISCELLANEOUS PROVISIONS.**

**Hydraulic cylinders shall be welded in accordance with ASME BPV VIII Div 1, Section VIII. Piping shall be welded in accordance with ASME B31.1 and Section 05093 WELDING PRESSURE PIPING.**

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## 1.6 DELIVERY, STORAGE, AND HANDLING

## 1.6.1 Packaging

The hydraulic power systems shall not be prepared for shipment until they have been inspected and accepted for shipment at origin by the Contracting Officer or his authorized representative, unless inspection has been waived in writing. Each hydraulic power system or subassembly shall be shipped completely assembled. The subassemblies shall be defined as the following:

- a. Hydraulic cylinders
- b. Hydraulic power units
- c. Piping assemblies
- d. Hydraulic Valve Manifolds

\*1

The subassemblies shall be provided with adequate protective pads, supports, and blocking and shall be securely restrained to prevent distortion or **damage in transit. Piping ports and connections shall be provided with plugs or caps to prevent damage and contamination during transit.** Any loss or damage during shipment, including damage to the painted surfaces, will be considered the responsibility of the Contractor, and shall be replaced or repaired without cost to the Government. All accessories and spare parts shall be packed separately in containers plainly marked "ACCESSORIES ONLY," and "SPARE PARTS ONLY." A packing list, listing the contents of each container, shall be placed in a moisture-proof envelope and securely fastened to the outside of the container. Standard commercial packaging in accordance with ASTM D 3951 will be acceptable except where a different method or standard of packaging is specified.

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## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

## 1.6.2 Shipping, Preservation, and Storage

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Prior to shipment the hydraulic cylinders shall be filled with the specified hydraulic fluid and the piping connections sealed. Packing, crating, cradles, etc., necessary to ensure safe shipment are the responsibility of the Contractor. Machined surfaces shall be adequately protected from corrosion and physical damage. Provisions shall be made with external shipping devices to prevent damage to the cylinder and piston rod resulting from the rod flexing up and down in the cylinder during transport. Internal rod supports are not acceptable. The Contractor shall submit his proposal for controlling movement of the piston rod for approval. Equipment delivered and placed in storage shall be stored with protection from the weather, humidity, temperature variation, dirt and dust, or other contaminants. The contractor shall provide individual storage frames on-site for each cylinder. The storage frames will hang the hydraulic cylinders in a vertical position with the rod end of the cylinders pointing down. All the storage frames shall become the property of the government. **The contractor will retain ownership of all hydraulic power systems equipment until installed into the lock, fully functional with the control systems and accepted by the government.**

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## 1.7 PROJECT/SITE CONDITIONS

The Contractor shall visit the site to thoroughly familiarize himself with all details of the work and working conditions, to verify dimensions in the field, and he shall then advise the Contracting Officer of any discrepancies prior to performing any work. The General Contractor shall be specifically responsible for the coordination and proper relation of the work to the structure and work of all trades.

## 1.8 WARRANTY

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All equipment shall be guaranteed for a period of 2 years from the date of acceptance. Replacement parts shall be guaranteed for 1 year from date of replacement. Warranty shall be against defective materials, design, and workmanship. In cases where the equipment manufacturer's advertised minimum guarantee is in excess of 2 years, it shall remain in force for its full period. Upon receipt of notice from the Government of failure of any of the parts during the warranty period, new replacement parts shall be furnished and installed promptly at no additional cost to the Government **in a timely manner.**

\*1

## 1.9 OPERATION AND MAINTENANCE INSTRUCTIONS

The Contractor shall furnish 6 complete sets of instructions containing the manufacturer's operation and maintenance instructions for each piece of equipment to the Contracting Officer in accordance with Section 01800 and as follow. . Each set shall be permanently bound and shall have a hard cover. One complete set shall be furnished prior to field testing and the remaining sets shall be furnished before the contract is completed. The following identification shall be inscribed on the covers: "OPERATING AND MAINTENANCE INSTRUCTIONS," title of the project, location of the project, the name of the Contractor, and the contract number. A flysheet shall be placed before instructions covering each subject. The instruction sheets

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

shall be approximately 8 1/2 by 11 inches, with large sheets of drawings folded in. The instructions shall include, but not be limited to, the following:

- a. A cross-section drawing of the hydraulic cylinder with parts list.
- b. A system layout drawing showing the piping, valves, and controls.
- c. A system hydraulic schematic.
- d. Electrical wiring and control diagrams.
- e. Operating and maintenance instructions.
- f. Manufacturer's bulletins, catalog cuts, and descriptive data.
- g. Parts lists and recommended spare parts.
- h. Handling instructions and weight of cylinders, power units, valve manifolds.

The Operation and Maintenance (O&M) Manual shall contain all information which may be needed or useful for operation, maintenance, repair, dismantling or assembling, and for identification of parts for ordering replacements. The manual will be subject to approval.

#### 1.10 SCHEMATIC AND DRAWINGS

Contractor shall submit each of the following in conformance with ANSI T2.24.1.

##### 1.10.1 Preliminary Drawings

Preliminary drawings shall be of sufficient detail and content to verify that the form and function of the hydraulic power system is consistent with the design parameters.

##### 1.10.2 Shop Drawings

Detailed shop drawings shall include fabrication, shop assembly, delivery, and field installation drawings. Any component part of fabricated items omitted from the contract drawings shall be detailed on the shop drawings.

##### 1.10.3 Fabrication Drawings

Fabrication drawings shall be provided for all mechanical and structural parts or components except those which are of standard manufacture. The drawings shall show complete details of materials, tolerances, machined surface finishes, connections, and proposed welding sequences which differentiate shop welds and field welds.

##### 1.10.4 Shop Assembly Drawings

Shop assembly drawings shall provide details for connecting the adjoining



fabricated components in the shop to ensure satisfactory field installation.

#### 1.10.5 Hydraulic Schematic

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Hydraulic Schematic: Hydraulic schematics shall use symbols that are in accordance with ASME Y32.10. Information conveyed in the schematics shall be in accordance with ISO 1219. All hydraulic components shall be shown on the schematic, and all setpoint and size parameters shall be indicated for each component. Preliminary schematic shall be submitted for approval before fabrication of the equipment begins. Final schematic shall be submitted prior to the beginning of final equipment test. Changes occurring during installation of the equipment shall be reflect on As-built drawings. Contractor shall submit, for approval, As-built drawings at the time the government accepts the hydraulic power system.

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#### 1.10.6 Delivery Drawings

Delivery drawings shall provide descriptions of methods of delivering components to the site, including details for supporting fabricated components during shipping to prevent distortion or other damage.

#### 1.10.7 Field Installation Procedures

Field installation drawings shall provide a detailed description of the field installation procedures. The description shall include the location and method of support of installation and handling equipment, the provisions to be taken to protect concrete and other work during installation, the method of maintaining components in correct alignment, and the methods for installing other appurtenant items.

### PART 2 PRODUCTS

#### 2.1 HYDRAULIC POWER SYSTEM COMPONENTS

##### 2.1.1 General

HYDRAULIC POWER SYSTEM COMPONENTS shall conform to the requirements indicated or specified, and if not specified, then HYDRAULIC POWER SYSTEM COMPONENTS of the best commercial grade quality suited to the intended use and as approved shall be furnished. The manufacturer's name, address, and catalog number shall be permanently displayed on a nameplate securely attached to each major item of equipment.

##### 2.1.2 Standard Products

Where items are referred to hereinafter as "similar and equal to" a particular manufacturer's product, such references have been made merely as a convenient method of indicating the type of material or equipment required, with no intention of asserting superiority thereof. The standard product of any reputable manufacturer regularly engaged in the commercial production of the type and quality of material or equipment referred to will not be excluded on the basis of minor differences, provided essential requirements of the specifications relative to materials, capacity, and performance are met. The Contractor shall, in accordance with paragraph

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

SUBMITTALS, furnish for approval, performance capacities and other pertinent information concerning the manufacturer's "equal to" standard products which he intends to incorporate in the work. "Equal to" standard products installed or used without such approval shall be at the risk of subsequent rejection.

## 2.1.3 Hydraulic Cylinders

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The hydraulic cylinder shall be of the single or double rod end type mill construction, as shown in the contract drawings, designed and manufactured to meet the criteria stated in paragraph DESIGN PARAMETERS. Stroke, bore and rod dimensions are shown on sheet **M-23, M-26 and M-27** of the contract drawings.

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## 2.1.3.1 Cylinder Tubes

Hydraulic cylinder tube shall have welded flanges and bolted heads and end caps as indicated in the contract drawings. The hydraulic cylinder tubes shall be a high strength carbon or alloy steel. Cylinder tubes which have been welded shall be stress relief heat treated and all welds shall be radiographed including those on mounts.

## 2.1.3.2 Cylinder Rods

Cylinder rods shall be provided with the type of rod ends indicated. Cylinder manufacturer shall be responsible for providing clevis and lifting eye ends of the cylinder. The amount of adjustment indicated for clevis connections shall be fully provided with no reduction in strength. Miter gate and culvert valve cylinder shall be supplied with stop tubes. Stop tube length shall be sized to limit bearing pressure on the rod bearing and piston to 1000 psi maximum. Miter gate latch cylinders shall be provided with cushions on both the rod and head sides of the piston.

1. Carbon or Alloy Steel Rods: Piston rods shall be a high strength carbon or alloy steel with either of the the following plating/coating options,

a. Nickel and Chrome Plating: Carbon or alloy steel rod shall first receive nickel plating then a chrome plating process. Nickel plating shall be a minimum of 0.003 inch thick and shall be of high phosphorous content. The nickel plating process shall be similar to Enplate NI-425 by Enthone Incorporated which has a phosphorous content of 10.5 percent to 12 percent by weight. Chrome plating shall be 0.005" thick and shall be in accordance with ASTM B 177.

b. Ceramic coating shall have a 0.008 inch minimum thickness, surface finish of 12 microinches RMS or better, surface hardness of 67 Rockwell C minimum, impact resistance of 5 to 11 lb-ft, modulus of elasticity of  $52 \times 10^6$  to  $60 \times 10^6$  psi, linear expansion coefficient of  $4.0 \times 10^{-6}$ /degree F, and be capable of withstanding a fracture force of 41 ksi minimum. The ceramic coating shall provide a homogeneous, uninterrupted, non-conducting and impermeable layer capable of providing corrosion resistance for a

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

minimum of 1000 hours in accordance with ASTM G 85. The use of sealers shall not be permitted.

2. Stainless Steel Rods: Cylinder rod shall be plated with chrome. Chrome plating shall be 0.008" thick and shall be in accordance with ASTM B 177.

## 2.1.3.3 Position Indicators

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Electric components, of the position indicators external **to** the cylinders, shall be housed in an enclosure that meet the IP 68 standard in accordance with IEC 60529. Position **indicator** control wiring from the hydraulic cylinder to control buildings shall be enclosed in conduits, junction boxes, etc., that meet the IP 68 standard.

1. Miter gate and culvert valve cylinders shall be supplied with position indicators and transmitters to meet the electrical characteristics given in section 16900 paragraphs titled "MITER GATE CONTROL" and "CULVERT VALVE CONTROL". The position indicator and transmitter shall be integral to the hydraulic cylinder. The position indicator and transmitter will connect to the control system described in section 16900 CONTROL AND INSTRUMENTATION. Position indicators shall be capable of determining cylinder position, at any position along the stroke, upon restoration of power after an electrical interruption/outage without resetting or recalibrating the indicator.

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2. Miter gate latch cylinders shall have two double pole single throw (DPST) normally open limit switches integral with the cylinder. One limit switch shall be fabricated in the rod cap, the other fabricated in the head end cap. The limit switch contacts shall be closed by an actuator that engages the cylinder cushions at the ends of the cylinders stroke. The limit switches will connect to the control system described in section 16900 CONTROL AND INSTRUMENTATION.

## 2.1.3.4 Miscellaneous Cylinder Components

Rings, bearings, packing, packing rings, retaining rings, seals, wiper-scrappers, etc., shall be manufacturers standard products fabricated from the finest selected quality materials. Piping connections shall be SAE J1926/1 or SAE J1453 fittings. Air bleed ports shall be provided. Valve manifolds shall conform to ANSI B93.7,

## 2.1.3.5 Mounts, Connections and Bearings

Mounts, brackets, clevis and pinned connections shall be of the style shown on the contract plans. Trunnions and connecting pins shall be fabricated from ASTM A 564/A 564M, Type 630, Condition H-1150, stainless steel and chrome plated in accordance with ASTM B 177. Surface finish on trunnions and connecting pins shall be the minimum required for the selected approved bearings/bushings installed. Trunnion and clevis bearings shall be self lubricating bearing such as HMI wearing and bearing "Feroform T814" or Thordon "HPSXL TRAXL" or an approved equal. Graphite or oil impregnated bearings will not be acceptable.

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#### 2.1.4 Hydraulic Power Units

The hydraulic power units shall be as designed by the Contractor in accordance with ANSI T3.16.3 **and as specified below** to operate the hydraulic cylinders based on the criteria stated in the paragraph DESIGN PARAMETERS. The power units shall be designed to meet the space limitations shown on the contract drawings and shall be configured essentially as shown in the hydraulic schematic on sheet M-31. Hydraulic power unit shall consist of pumps, motors, oil reservoir, and valve manifolds **with** pressure relief valves and hydraulic fluid conditioners, pressure switches and gauges, temperature sensing and indicating devices, control console. Noise level shall not exceed 77dB at design fluid pressures and flow rates at distance of 7 feet. Electrical work shall conform to section 16415 ELECTRICAL WORK, INTERIOR.

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##### 2.1.4.1 Fluid Reservoirs

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The **fluid** reservoir shall be 250 gallon capacity. The reservoir shall be made of stainless steel with welded joints and shall conform to the requirements of ANSI T3.16.2 R1 and as shown. Threaded fittings and ports, and flange connections shall be SAE type. The reservoir shall be equipped with a sight glass for fluid indication and float switches for high fluid level (warning and shutoff), low level (warning and shutoff). **Fluid** reservoir shall be equipped with **fluid heater**, thermometer, and temperature indicator and transmitter. Reservoir shall also be equipped with valve and filter manifolds. There shall be a baffle provided between the intake and return lines to facilitate the separation of air and foreign matter from the hydraulic fluid. Both the intake and return pipes shall be brought down to a distance of 1 1/2 pipe diameters above the tank bottom. Interior surfaces of the reservoir shall be cleaned down to bright metal and coated with an epoxy-based urethane finish or an approved alternate that is compatible with oil and water.

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##### 2.1.4.2 Reservoir Manifolds

Reservoir manifolds shall be in accordance with paragraph titled MANIFOLDS.

One manifold shall have pump pressure relief valves mounted onto it. The other manifold shall provide a mounting point for the system filters.

##### 2.1.4.3 Reservoir Heater

The reservoir shall be provided with one or more screw plug type immersion heaters with a watt density not to exceed 11 watts per square inch and a built-in thermostat set to maintain the hydraulic oil at 55 degrees F. The heater sheath and screwplug shall be fabricated from stainless steel. The surface of the heater element shall not exceed 10 watts per square inch at the design voltage. The heater shall be a 460 volt, 60 Hz, 3 phase type heater. The heater shall be supplied with stainless steel, NEMA 4X terminal housing as a minimum.

##### 2.1.4.4 Flexible Breather

Each hydraulic power unit shall be provided with a flexible bladder breather to eliminate the introduction of outside air during normal

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

operation of the hydraulic system. The breathers shall be sized by the contractor. Each bladder shall come complete with an internal desiccant dryer and a pressure/vacuum relief valve. The desiccant drier shall be readily accessible for maintenance and shall have an easily replaceable desiccant cartridge. The dryer shall have an indicator that changes color to indicate when the dryer requires changing. The breather bladders shall be compatible with the specified hydraulic fluid. The contractor shall provide all materials necessary to connect the breather. An emergency vent valve shall be provided in the breather piping to permit venting the reservoir during setup or extra ordinary operation. The air in the reservoir will be directed to the flexible breather during normal operations.

## 2.1.4.5 Pumps

Shall be a electric motor-driven, variable or fixed displacement as indicated on the contract plans. Pumps shall deliver fluid to meet requirements shown in the paragraph titled DESIGN PARAMETERS. The pumps shall have a minimum overall efficiency of 88% at the maximum flow rate given in the paragraph DESIGN PARAMETERS. Pumps shall be manufacturers standard catalog item for a minimum of two years and is currently commercially available. The pumps shall not exceed the power rating of the specified motor at all operating conditions. All the components of the pumps shall be compatible with the specified hydraulic fluid. Maximum rotating speed shall be 1800 rpm. Exposed rotating parts shall be properly safety guarded. The pumps shall mount on the reservoir in a manner similar to that shown on the drawings. The pumps shall be rated for continuous operation at a discharge pressure equal to or greater than the system design pressure. The rated discharge capacity of each pump shall not be less than indicated when the pump is operated at the design input speed and discharge pressure. Pumps 1 and 2 shall be axial piston, pressure-compensated variable displacement type with integral horsepower limiting, suitable for pumping hydraulic oil into a closed hydraulic system. Pump 3 shall be fixed displacement gear type. Each pump shall be independently operable such that failure of one pump will not disable the entire hydraulic power unit.

## 2.1.4.6 Pump Pressure Relief Valves

Pump pressure relief valves shall be manifold mounted and in accordance with paragraph PRESSURE RELIEF VALVES.

## 2.1.4.7 Motors

## \*1

The motors shall operate on 460 volts, 60 Hz, three phase power and have NEMA B design with Class F or H insulation. Motors shall conform to the applicable requirements of NEMA Pub. No. MG1. Motors shall have maximum speed of 1800 rpm. The motor shall be rated for continuous full load operation without exceeding the standard temperature rise for the class of insulation and frame construction used. The motor shall have a 1.15 service factor. Each pump shall be driven by an individual motor. Motors for pumps 1 and 2 shall be 40 HP. Motor for pump 3 shall be 7 1/2 HP. The motor shall be mounted in such a manner as to allow for start-up and operation of the motor and pump without transmitting excessive vibration or

other forces to the hydraulic power unit in a detrimental manner. Motors shall be connected to pump drive shafts by flexible drive couplings that are adequately rated for the horsepower and torque being transmitted.

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#### 2.1.4.8 Kidney Loop Filter Circuit

Kidney loop filters shall be manifold mounted. Filter circuit shall be equipped with bypass valves and pressure differential switches to monitor filter contamination. Filters shall be spin-on type. Contractor shall provide additional filtration if required for their selected and approved equipment. Filter capacity and efficiency shall be rated per ISO 4572. Filter efficiency shall in terms of Beta ratio. Filter collapse strength shall be rated per ISO 2941. Filter collapse strength shall be greater than the differential pressure across filter element at 90 percent contamination capacity. Bubble point of the filter elements shall be rated per ISO 2942. The filter shall be rated for use with mineral oil based hydraulic fluid. Compatibility with hydraulic media shall be tested in accordance with ISO 2943. Filter media temperature range shall be 32°F to 160°F. Pressure differential switches shall be set to close when pressure drop across the filter elements is equal to 80 percent contamination condition of the filter.

a. Primary Filter - The filter element selected shall have a minimum rating of  $\text{Beta}_2 = 20$ ,  $\text{Beta}_3 = 75$  and  $\text{Beta}_6 = 200$ .

b. Water Removal Filter - Filter elements shall separate water from mineral oil based fluids. The filtration rating shall be 40  $\mu\text{m}$  absolute,  $\text{Beta}_{40} = 75$ . Maximum permissible differential pressure across filter elements is 145 psi.

#### 2.1.4.9 Return Line Filter

Filter shall be manifold mounted. Filter circuit shall be equipped with bypass valve and pressure differential switch to monitor filter contamination. Filter shall be spin-on type. Contractor shall provide additional filtration if required for their selected and approved equipment. Filter capacity and efficiency shall be rated per ISO 4572. Filter efficiency shall be in terms of Beta ratio. Filter collapse strength shall be rated per ISO 2941. Filter collapse strength shall be greater than the differential pressure across filter element at 90 percent contamination capacity. Bubble point of the filter elements shall be rated per ISO 2942. The filter shall be rated for use with mineral oil based hydraulic fluid. Compatibility with hydraulic media shall be tested in accordance with ISO 2943. Filter media temperature range shall be 32°F to 160°F. Pressure differential switch shall be set to close when pressure drop across the filter element is equal to 80 percent contamination capacity of the filter. The filter element selected shall have a minimum rating of  $\text{Beta}_5 = 10$ ,  $\text{Beta}_{10} = 75$  and  $\text{Beta}_{15} = 200$ .

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#### 2.1.4.10 Thermometer

A direct indicating thermometer shall be provided to indicate fluid temperature in the reservoir. The thermometer shall be of the bimetallic

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

type mounted directly on the reservoir. The thermometer shall have a minimum 3 inch dial with black markings on a white background. The scale range shall be 20 to 240 degrees F. The case and stem shall be corrosion resistant, and the wetted components shall be stainless steel. Thermometer wells of the separable socket type shall be provided for each thermometer.

## 2.1.4.11 Temperature Transducer

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Temperature transducer and transmitter shall be provided to sense the oil temperature in the reservoir and function within the temperature range of 20 - 240 degrees Fahrenheit. **The temperature transducer shall be of the thermocouple type.** The temperature transmitter shall have a 4-20 mA output signal. Temperature indicator and transmitter shall connect to the PLC control system, described in section 16900 CONTROL AND INSTRUMENTATION, so that the lock operator may monitor and be warned about hydraulic oil temperature conditions.

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## 2.1.4.12 Fluid Level Float Switches

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Float switches shall be single pole double throw. Float switches shall connect to the PLC control system and warn the lock operator of low/high fluid levels.

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## 2.1.4.13 Differential Pressure Switch

Pressure differential switch shall be connect to the PLC control system to alert the lock operator to possible contaminated filters. Pressure switches shall have a minimum pressure rating of 5000 psi. Pressure switches shall be set to close at the relief valve setting. Pressure switches shall be connected to the control system described in section 16900 CONTROL AND INSTRUMENTATION. **The switches shall be provided with contacts having a minimum rating of 5 amps, 125/250 volts AC.**

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## 2.1.4.14 Gauges

Pressure gauges shall be installed on the hydraulic power units as indicated. Each pressure gauge shall have a pressure snubber. Pressure gauges and pressure snubbers shall be as specified in paragraphs "PRESSURE GAUGES" and "PRESSURE SNUBBERS" respectively.

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## 2.1.4.15 Control Console

A control console shall be mounted on the hydraulic power unit. Console shall allow the starting/**stopping** of the hydraulic power unit; Shall be able to start/stop pumps individually; Shall have indicators showing which pumps are running; Shall show vital information using **LED displays** such fluid flow rates (**gpm**), fluid pressures (**psi**) and temperatures (**degrees F**). **Electrical components contained in the control console shall be as specified in the paragraph "ELECTRICAL EQUIPMENT", below.** Console will be a basic frame with metal panels using standardized components where available to meet the functional characteristics specified. The console shall be constructed of steel meeting the requirements of NEMA ICS 6.

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

Steel sheet shall conform to ASTM A 659/A 659M. Removable panels shall be secured in place using captive, spring-loaded, self-locking spring nuts and hardened sheet metal screws. Screws and nuts shall be stainless steel. Access panels shall be secured with spring-loaded, quarter-turn fasteners with studs held captive in the removable panel. The console shall be equipped with adequate louvered panels to ventilate the interior and dissipate the heat generated within the console. Special equipment supports and guides shall be provided as required to support the equipment and other components within the console. The interior and exterior surfaces shall be finished with one coat of primer and two coats of the manufacturer's standard baked-on white enamel finish.

\*1

## 2.1.4.16 Nameplates and Instruction Plates

Nameplates shall be provided for each device on the control console. Nameplates shall clearly indicate the function of each device. Instruction plates shall clearly indicate the proper procedures and sequences of operations to activate the system, to operate the system, and to secure the system after completion of operation. Lettering on nameplates shall be machine engraved on steel plate. Instruction plates shall be mounted on a rigid backing and covered with clear, rigid plastic sheeting. Instruction plates shall be mounted in a location easily visible to an operator stationed at the console or panel.

## 2.1.4.17 Security Provisions

Control consoles shall be constructed to prevent unauthorized or accidental operation of the system. The main power control switch mounted on the control console shall be a key-operated type. The control console shall be provided with a hinged cover with a key-operated lock arranged to automatically lock the cover in the closed position.

\*1

## 2.1.5 Pressure Gauges

Pressure gauges shall conform to ASME B40.100, have a black enameled metal case, a 4 inch dial, and a stainless steel Bourdon tube. The scale range of the gauge shall be approximately 150 percent of the maximum pressure of the line in which installed. Gauges shall be the safety type with solid fronts and blowout backs. Each gauge shall be provided with a pressure snubber. The pressure gauges shall be panel mounted or manifold mounted as shown. Gauges shall have a ball valve installed as shown so that pressure may be shut off to the gauge port for service.

\*1

## 2.1.6 Pressure Transducer and Transmitter

\*1

Pressure transducer and transmitter shall be provided to sense the oil pressure at the positions indicated on the hydraulic schematic in contract plans and function within the pressure range of 0 - 5000 psig. The transmitter shall produce a 4-20 mA output signal. The transmitter will connect to the PLC control system described in Section 16900 CONTROL AND INSTRUMENTATION. Pressure transducer and transmitter shall have a ball valve installed as shown so that pressure may be shut off to the port for service.

\*1



## 2.1.7 Pressure Snubber

Pressure snubber shall be provided for all pressure gauges, pressure switches, and pressure transducers to protect against shock and provide more stable instrument operation. Snubber shall be of stainless steel construction.

## 2.1.8 Manifolds

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Valve and filter manifolds shall be provided for as indicated on sheet M-31 in the contract plans. Each manifold shall be constructed of aluminum or ductile iron by machining from a solid block of material. Material selection shall be suitable for the design pressures and environment. Manifolds shall be fabricated by a manufacturer regularly engaged in the production of custom valve manifolds for at **least** 10 years. Manifolds shall be in accordance with ANSI B93.7. Ports and passages shall be machined smooth and shall be free of burrs and sharp corners. Manifold interconnecting passages and valving shall be so arranged as to provide the system connections and functions as shown on the drawings. Surfaces and recesses, where valving and other components will be installed, shall be machined to the manufacturers standard specifications of the applicable valve component. It shall be the responsibility of the Contractor to confirm the dimensions for all valve surfaces and recesses. Provision shall be made for attaching the hydraulic piping and tubing to the manifolds by the use of flanged or threaded connections. Flanged and threaded connection shall be of the SAE type. The manifolds shall be designed for an internal pressure of not less than 5000 psi. Components shall be located on the manifold in positions where they may be readily replaced or adjusted after installation.

\*1

## 2.1.9 Valves

\*1

Valves shall have a minimum pressure rating of 5000 psi unless stated otherwise. Valves shall have a operating temperature range of -20 to 160 degrees Fahrenheit. Valves shall be specifically designed and rated for hydraulic system applications. The flow rating shall be verified by the Contractor in accordance with the design criteria stated in paragraph DESIGN PARAMETERS. The valves shall be sized for 150% of the maximum anticipated flow rates. Valve seals shall be compatible for use with the specified hydraulic fluid. Valve seals and seats shall be replaceable without disturbing the piping if valve is line mounted. Valves shall be supplied with all hardware required for mounting. Threaded ports where used shall conform to SAE J1453.

\*1

## 2.1.9.1 Ball Valves

Ball valves shall be made of stainless steel. Valves 1 inch or larger shall have socket-welded piping connections. Valves less than 1 inch shall have thread ends. Handles shall be stainless steel, or chrome plated carbon or alloy steel.

## 2.1.9.2 Control Valves

\*1

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

a. Flow - Flow control valve shall be cartridge type for manifold mounting. The valves shall be pressure-compensating, and adjustable. Flow adjustment shall range **from** 0 gpm to 7.5 gpm. The valves shall be capable of being locked in position to prevent an unintentional adjustment.

b. **Solenoid-Controlled Four-Way** Directional Control Valves - Solenoid-controlled four-way directional control valves shall be three position and spring centered as shown. The valves shall have two solenoids. The valves shall be manifold mounted. The solenoids shall operate at 120 volts AC. The valves shall have manual overrides capability on the valve body.

c. Proportional Valves - Proportional valve assemblies shall be manifold mounted. The valve assemblies shall consist of a four-way, three-position, Proportional directional control valve with on-board electronics. The valve shall have built-in electronics to accept discrete or variable inputs for actuator speed control as stated in the DESIGN PARAMETERS. The electronics shall be capable of calibration in order that actuator speed may be fine tuned. The valve shall have manual override capability on the valve body. Each valve shall be furnished with a suitable regulated power supply with overvoltage protection.

d. Solenoid Operated Flow Diverter - Solenoid-controlled three-way flow diverter valves shall be two position as shown. Valves shall be spring positioned as shown. The valves shall have one solenoid that operates on 120 volts AC. The valves shall be manifold mounted. The valves shall have manual override capability on the valve body.

\*1

## 2.1.9.3 Pressure Relief Valves

Pressure relief valves shall be adjustable.

\*1

a. Internally Piloted - A full flow relief valve shall be used where shown. The valves shall have an adjustment range of 50 to 3500 psi. Adjustable orifices shall be provided as necessary for proper functioning and smooth operation of the valve. The valve shall be pilot operated, cartridge design for manifold mounting.

b. Externally Piloted - A full flow relief valve shall be used to provide system pressure relief and venting. The valve shall have a minimum adjustment range of 1000 to 5000 psi. The valves shall be pilot operated by an external source, and **be** manifold mounted.

\*1

## 2.1.9.4 Check Valves

Check valves shall be of cartridge type for manifold mounting designed for high shock and 5000 psi service unless otherwise noted below. Check valves shall have zero leakage when seated.

a. Filter Bypass Spring Loaded Check Valves - Shall be designed for 3500 psi service. Cracking pressure shall be selected based on the

differential pressure characteristics of the chosen filter elements.

\*1

#### 2.1.9.5 Counterbalance Valves

Counterbalance valves shall be installed as indicated to balance the load being held by the cylinders. Valves shall be of the type shown on sheet M-31 and specified below. The valves shall be directly operated and shall be adjustable for operating over a expected pressure range. The valves shall be designed for a system operating pressure of 3000 psi, with pressures peaking as high as 5000 psi.

a. Flow Controlled Counterbalance Valves - Valves shall be of the load check type. The valves shall be leak-free, pilot operated, with tamper proof pressure setting for opening. When closed, the valves shall prevent cylinder drift. The valves shall be externally piloted. The pilot ratio shall be 20:1. When the valve is in the open position the flow of fluid through the valve shall be throttled to prevent the actuator from "running away". The flow rate of fluid through the valve shall be restricted when flow rate out of the actuator exceeds pump flow rate into the actuator. Valves shall be manifold mounted where they may be readily replaced and adjusted after installation. Valves shall be similar and equal to Rexroth Model No. FD..PA2X/B., See data sheet RA 27 5.51/5.94.

b. Counterbalance Valve With Manual Bypass - Valves shall be of the load check type. The valve shall be leak-free, pilot operated for opening. When closed, the valve shall prevent cylinder drift. The valve shall be externally piloted. The pilot ratio shall be 3:1. Cracking pressure shall be 50 psi. When the valve is in the open position the flow of fluid through the valve shall be unrestricted. Valves shall be manifold mounted in positions where they may be readily replaced or adjusted after installation.

c. Manually Operated Counterbalance Valves - Valves shall be of the load check type. The valves shall be leak-free. When closed, the valve shall prevent cylinder drift. Valves shall open only by manual operator located on the valve body. When the valve is open flow of fluid through the valve shall be unrestricted. Valves shall be manifold mounted in positions where they may be readily replaced or adjusted after installation.

\*1

#### 2.1.9.6 Air Bleed Valves

Bleeder valves shall be 1/4 inch, stainless steel construction, and wrench operated.

#### 2.1.10 Power Piping

\*1

Hydraulic piping shall be butt welded stainless steel pipe in accordance with ASME B31.1 and Section 05093 WELDING PRESSURE PIPING excluding flexible hoses and hydraulic tubing. Flexible hoses shall be used at hydraulic cylinders as shown. Threaded fittings shall be used to make flexible hose connections. Stainless steel tubing and fittings may be used on the hydraulic cylinders.

\*1

## 2.1.10.1 Stainless Steel Pipe

\*1

Pipe shall be seamless stainless steel conforming to ASME B36.19M and ASTM A 312/A 312M, Grade TP304. The piping weight class shall be as shown.

**Stainless steel piping shall have the internal diameter cleaned of grease, mill scale, burrs and foreign objects then the ends capped by the supplier.**

\*1

## 2.1.10.2 Pipe Fittings

\*1

Pipe fittings shall be the socket welding type conforming to ASME B16.11 and made of stainless steel conforming to and ASTM A 182/A 182M, Grade F304.

The pressure class shall be 6,000 pounds per square inch. Unions shall be the O-ring type, made of stainless steel with socket-welding ends. The Contractor may at his option substitute four bolt split flanges with Buna N or Viton O-rings for the unions. Flanges shall conform to ASTM A 182/A 182M with the grade suitable for the pipe to which attached. Flange shall conform to SAE J518. Threaded fittings shall also conform to the above, but shall be used only where absolutely necessary for the application. Threaded fittings where used shall conform to SAE J1453.

\*1

## 2.1.10.3 Hydraulic Tubing

Tubing shall be seamless stainless steel tubing conforming to ASTM A 789/A 789M. The wall thickness shall be selected to provide a safety factor of 6 based on the manufacturer's ratings for burst strength.

## 2.1.10.4 Tube Fittings

\*1

Tube fittings shall be made of stainless steel and be the flareless type with SAE straight threads and Buna N or Viton O-ring seals. The threads on fittings shall conform with SAE J1453. \*1

\*1

## 2.1.10.5 Flexible Hydraulic Hose

Flexible hydraulic lines shall be wire-reinforced, high-pressure-type hose made of neoprene or Buna N. Hose shall be resistant to sunlight. Flexible hose shall be rated by the manufacturer for a working pressure not lower than the system operating pressure with a factor of safety of 4. Fittings shall be specifically designed for use with the hose selected and shall be as recommended by the hose manufacturer. Fittings shall be made of stainless steel and shall be the reusable type. Hose fittings shall be SAE J1453.

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## 2.1.11 Bolts, Nuts, and Washers

## 2.1.11.1 Structural Bolted Connections

Structural bolted connections carrying primary loads shall be made with ASTM A 325 bolts with ASTM A 563 nuts and ASTM F 436 hardened washers.

## 2.1.11.2 Stainless Steel Bolts, Nuts and Washers

Stainless steel bolts and nuts shall conform to ASTM A 193/A 193M, Grade B7 or B16, with ASTM A 194/A 194M, Grade 8 nuts. Flat washers shall conform to ASTM F 844.

\*1

#### 2.1.12 Hydraulic Fluid

The selected and approved hydraulic fluid shall be available to the project from a distributor located in or around the Louisville, KY area. The hydraulic fluid shall be an ashless, mineral oil based product with the following properties. The hydraulic fluid chosen shall be approved for use with all components of the system. The fluid shall have a viscosity grade of ISO VG 46 and viscosity index of 140 minimum. Water separation shall occur in less than 10 minutes in accordance with ASTM D 1401 to prevent emulsions and promote removal. The fluid shall have additives that inhibit rust and oxidation and provide anti-wear and anti-foam properties. Oxidation life shall be 3000 hours or greater in accordance with ASTM D 943.

It shall pass rust protection test in accordance with ASTM D 665 A & B. Foaming Tendency/Stability as determined by ASTM D 892 sequence I, II, and III and shall be 20/0. The fluid shall have a maximum pour point of -49 degrees F as determined by ASTM D 97. Minimum flash point of 331 degrees F as measured by ASTM D 92. Viscosity shall meet 225 SUS at 100 degrees F and 53 SUS at 210 degrees F. The selected hydraulic fluid shall be used during shop testing, to fill the cylinders before shipment, flush the system piping, and to fill the complete hydraulic system. Only fresh hydraulic fluid shall be added to the installed system and individual components during testing. Hydraulic fluid added to the installed system shall be transferred from storage drums to the reservoir using a Portable Filtering System as specified herein. All hydraulic fluid shall be supplied by the Contractor and two 55 gallon containers shall be furnished to the Government for a reserve supply.

#### 2.1.13 Portable Filtering System

The contractor shall provide a portable filtering system consisting of a cart with drip tray, pump and motor, two hose assemblies, and two filter assemblies. The cart and drip tray shall be of welded steel construction and painted with a coating that is resistant to hydraulic fluids. Cart shall have wheels with steel axles and two handles with hand grips. Pump shall be gear type and have 10 gpm capacity at 3450 rpm. Motor shall be 115 volt, single phase, 60 Hz, rated 0.75 hp at 3450 rpm. Motor shall have thermal overload protection. Motor shall come with 20 foot electrical cord with retractable cord reel. Hose assemblies shall each consist of 6 foot of flexible PVC hose and 3 foot wand of rigid PVC pipe. Transition from flexible hose to pipe shall be made with metal fittings and metal hose clamps. One hose assembly shall connect to the inlet filter, the other hose assembly shall connect to the outlet filter. System shall have one intake filter assembly and one outlet filter assembly. Filter assembly shall consist of an aluminum filter bowl and head, filter and steel tubing.

Head shall contain filter bypass valve and visual indicator of filter cleanliness. Head shall bolt to the filter bowl. Visual indicator shall be differential pressure type and have 3 band scale (clean, change, bypass). Head shall be serviceable. Flexible hose end of the hose assembly shall connect to the head. Tubing shall be steel and connect the

filter bowl to the gear pump using threaded fluid connectors. Filter installed in the intake filter assembly shall be of the water removal type.

At 10 gpm the intake filter shall have the water capacities for fluids with the following viscosities,

<u>Capacity</u>	<u>Fluid Viscosity</u>
190 mL	75 SUS
80 mL	200 SUS

Outlet filter shall have the following beta ratios  $B_2=2$ ,  $B_6=20$  and  $B_{10}=75$ . Outlet filter media shall be cellulose or microglass. All seals shall be BUNA N.

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## 2.2 ELECTRICAL EQUIPMENT

### 2.2.1 General

\*1

Electrical equipment not otherwise specified elsewhere in this specification section shall be as follows. Other electrical materials and equipment required for the installation of the hydraulic power systems not covered in this specification section and above elevation 443 shall be as specified in Section 16415 ELECTRICAL WORK, INTERIOR. Electrical items installed below elevation 443 shall be rated IP 68 against water intrusion as defined in IEC 60529. All electrical equipment furnished shall be standard catalog items under regular manufacture with existing catalog ratings equal to or better than the requirements of the contract drawings and specifications. The Contractor's request for approval of equipment other than as specified or as shown shall be accompanied by technical and descriptive data and specifications sufficient for the Contracting Officer to determine its adequacy. Unless otherwise specified or indicated, all electrical materials and equipment shall meet the standards, specifications, and tests referenced.

\*1

### 2.2.2 Conduit, Duct, and Accessories

Threads on the following equipment shall be American Standard. No metric threads will be accepted.

#### 2.2.2.1 Conduit and Cabinet Supports

Conduit and cabinets shall be supported as required by ANSI 70. The supports shall be galvanized.

### 2.2.3 Cabinets and Boxes

Cabinets and boxes shall be stainless steel, NEMA 4X housings sized as required. The cabinet and box hubs shall be consistent with the NEMA 4X rating of the box. Cabinets and boxes shall be mounted such that the NEMA 4X rating is not compromised. Threads on the hubs shall match the threads on the conduit and shall be American Standard. Metric threads will not be accepted. The cabinets and boxes shall conform to UL 50.

### 2.2.4 Control Components

## 2.2.4.1 Control Devices and Wiring

\*1

Manual or automatic control, protective or signal devices required for the specified operation and all control wiring for these controls and devices shall be provided whether indicated or not. Electrical control devices shall have minimum current and voltage ratings in accordance with the requirements of NEMA ICS 2 contact rating designation A 300, as applicable, unless larger ratings are indicated or are required. Control devices shall be provided with the number and arrangement of contacts required to perform the specified control functions. Devices located indoors shall be provided with or installed in NEMA 4X enclosures. **Devices located outdoors below elevation 443 shall be installed in enclosures or pathways rated as IP68.**

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## 2.2.4.2 Electronic Limit Switches

\*1

The electronic limit switches shall have solid-state, thumbwheel, programmable limits with a count/revolution range of 0000 to 3599; four decades of limit programming; set point switch function selection; initial power supply that provides four AC power levels (plus 5 V, plus 15 V, plus 24 V, **plus 120 V**) from standard 120 or 240 VAC sources; and outputs for read-outs on two digital displays (one remote digital read-out in the control room and one at the hydraulic power unit). The operating temperature range of the electronic limit switches shall be minus 20 degrees C to plus 65 degrees C. The limit switches shall be located and mounted as shown.

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## 2.2.4.3 Manual Switches

Manually operated switches, including push-button switches, selector switches, and key-operated switches, shall be heavy-duty, oil-tight type conforming to the requirements of NEMA ICS 1.

## 2.2.4.4 Relays

Relays used in control circuits shall be industrial magnetic control relays conforming to NEMA ICS 2 contact rating designation A 300, except where other ratings are indicated. Relays shall be applied in control circuits in such a manner that proper control functions shall be obtained regardless of whether the contacts are overlapping or non-overlapping.

## 2.2.4.5 Indicating Lights

\*1

Indicating light assemblies shall be the switchboard type, insulated for 120 volt **AC service**, with appropriate colored caps as indicated and integrally mounted resistors for 120 volt AC service. Color caps shall be made of a material which will not be softened by the heat from the lamp. Lamps shall be replaceable from the front of the panel, and any special tools required for lamp replacement shall be furnished by the Contractor. The indicating light assemblies shall be the same product line as compatible push buttons and switches.

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## 2.3 SPARE PARTS

The Contractor shall furnish spare parts in the quantities listed below:

\*1

ITEM	QUANTITY
1. Miter Gate Hydraulic Cylinder	1
2. Culvert Valve Hydraulic Cylinder	1
3. Variable Volume, Pressure Compensated, Horsepower Limiting Hydraulic Axial Piston Pump, (HPU Pump 1 & 2)	1
4. 40 Horsepower Motor for (HPU Pump 1 & 2)	1
5. Fixed Displacement Gear Pump (HPU Pump 3)	1
6. 7.5 Horsepower Motor for (HPU Pump 3)	1
7. Hydraulic Fluid Filters	3 of each type
8. Miter Gate Latch Hydraulic Cylinder	1
9. Proportional Directional Control Valve for Culvert Valve Hydraulic Cylinder	1
10. Proportional Directional Control Valve for Miter Gate Hydraulic Cylinder	1
11. Directional Control Valve for Miter Gate Latch Cylinder	1
12. Flow Controlled Counterbalance Valve for Culvert Valve Cylinder	1
13. Flow Controlled Counterbalance Valve for Miter Gate Cylinder	1 of each type
14. Manually Operated Counterbalance Valve for Culvert Valve Cylinder	1
15. Manually Operated Counterbalance Valve for Miter Gate Cylinder	1
16. Counterbalance Valve with Manual Bypass for Miter Gate Latch Cylinder	1
17. Pressure Relief Valve for HPU Pumps 1 & 2	1
18. Pressure Relief Valve for HPU Pump 3	1
19. Externally Piloted Pressure Relief Valve for Miter Gate Cylinder	1 of each type
20. 3 inch and 1.5 inch Ball Valves	2 of each type
21. Hydraulic Position Indicators	2 of each type

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## PART 3 EXECUTION

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## 3.1 SHOP ASSEMBLY AND TESTING

Each hydraulic power system shall be completely shop assembled and tested insofar as is possible using temporary piping and wiring to determine the correctness of fabrication and the matching of component parts to ensure acceptable operation after field erection. Shop tests shall be made in the presence of a representative of the Contracting Officer. Hydraulic power equipment shall not be shipped to the project site until shop assembly and testing has been, in the opinion of the representative of the Contracting Officer, satisfactorily completed. In the completion of the shop assembly and testing, preliminary acceptance will be made by the Contracting Officer.

## 3.1.1 Cleaning



Extreme care shall be taken during shop assembly to avoid inclusion of foreign materials into the equipment. Interior surfaces of hydraulic cylinders, fluid reservoirs, valve manifolds and temporary piping shall be free of visible contamination. Temporary piping and/or hoses connecting hydraulic power system components shall be flushed with the selected hydraulic fluid at a fluid velocity to create fully turbulent flow (Reynolds Number in excess of 4000). Fluid used for flushing shall be discarded. Hydraulic fluid used during shop assembly and testing shall have a cleanliness level of at least 14/11 in accordance with ISO 4406 and water content below 200 ppm. Prior to filling hydraulic equipment and flushing of piping, the equipment manufacturer shall take three 500 milliliter samples of hydraulic fluid from each storage container at different depths according to NFPA B93.19M to verify cleanliness level and water content. Testing of cleanliness level and water content shall be verified by an independent testing lab. Particle counting on each sample shall be performed in accordance with SAE ARP 598B

### 3.1.2 Cylinder Tests

Each cylinder shall be filled with the specified hydraulic fluid using the above specified PORTABLE FILTERING SYSTEM, taking care to exclude all air. Each cylinder shall then be hydrostatically tested at 500 psi on the rod end for a minimum of 4 hours. With the rod end fluid port blocked and a pressure gauge attached, pressurize the head end of the cylinder until the rod end test pressure is reached. Measure the position of the cylinder rod and record. Observe the pressure gauge. If pressure loss occurs at any time during the test, observe hydraulic cylinder for visible leakage, or advancing cylinder rod. Any cylinder displaying visible leakage will be rejected. If no visible leakage is found observe cylinder rod. Remeasure the position of the cylinder rod. A change in position of the cylinder rod indicates internal leakage in the cylinder. The hydraulic cylinder shall be rejected if the internal leakage is greater than 0.5 cc per minute for the miter gate and culvert valve cylinders and 0.05 cc per minute for the miter gate latch cylinders. The specified acceptable internal leakage equates to a change in position of the cylinder rod as follows

Cylinder Type	Allowable Cylinder Rod Change of Position
Miter Gate Cylinder	0.063 inch
Culvert Valve Cylinder	0.146 inch
Miter Gate Latch Cylinder	0.311 inch

### 3.1.3 Hydraulic Power Unit Testing

Each hydraulic power unit shall be filled with the specified hydraulic fluid using the above specified PORTABLE FILTERING SYSTEM. Once the hydraulic power unit is filled the hydraulic fluid shall be circulated by operating the kidney loop filter circuit a minimum of 4 hours, changing filters as they become contaminated. At the end of 4 hours, the fluid cleanliness level shall be checked to verify it meets at least 14/11 in accordance with ISO 4406 and water content below 200 ppm. Hydraulic fluid shall continue to be circulated until the fluid meets the required cleanliness level. Shop-fabricated hydraulic power units and control valves and valve manifolds shall be hydrostatically tested at the maximum

pressure allowed by the installed equipment. Valves and operators shall undergo a functional test and the pumps shall be tested to verify flow and pressure ratings. The power unit shall then be connected to a hydraulic cylinder and operationally tested at 3,000 psi. Any operational problems will be cause for rejection.

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### 3.2 INSTALLATION

#### 3.2.1 General

\*1

The Contractor shall install the equipment specified and as shown on the drawings to complete the hydraulic power system for operation of the miter gate **leaves**, culvert valves, and **miter gate latches**. Installation of hydraulic components shall be in accordance with the manufacturer's written instructions and under the direction of the erection engineer or manufacturer's representative. **Hydraulic power units, and hydraulic cylinders shall be installed without disassembly. Necessary supports for all appurtenances, pumps, motors, and other equipment or components shall be provided. Floor-mounted equipment shall be anchored to the floor by anchor bolts or expansion anchors.** Installation shall be in accordance with Section 05055 METALWORK FABRICATION, MACHINE WORK, MISCELLANEOUS PROVISIONS and Section 16415 ELECTRICAL WORK, INTERIOR.

\*1

#### 3.2.2 Cleaning and Flushing the System

\*1

Extreme care shall be taken during assembly to avoid the entrance of abrasives, dirt, metal chips, and other foreign materials into the hydraulic system through open ends of piping, tubing, and ports of the components. **Power piping and valve manifolds shall be flushed with warm hydraulic fluid (150 degrees F) at fluid velocities great enough to create fully turbulent flow, (Reynolds Number in excess of 4000), in all piping. Temporary filters shall be installed in the piping during flushing procedure. Hydraulic power unit pumps shall not be used for flushing procedure.** The Contractor shall submit a detailed cleaning and flushing **procedure** for approval in accordance with paragraph SUBMITTALS. **The procedure shall include a detailed description of the equipment, materials, solution temperatures, duration of each phase of the cleaning operation, and method of drying after cleaning. The procedure shall clean the system of particles so that the contamination level is below 14/11 in accordance with ISO 4406.** The Contractor shall take three 500 milliliter samples at approved locations according to NFPA B93.19M. Particle counting on each sample shall be performed in accordance with SAE ARP 598B by an approved independent test laboratory. Water content of each sample shall be below 200 ppm. If any sample does not comply with the permissible contamination limits, the system shall be recleaned and reinspected. When flushing is completed, the system shall be drained and then filled with the specified hydraulic fluid.

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#### 3.2.3 Filling and Bleeding the System

\*1

**Hydraulic fluid** used to fill the system shall be filtered through a **the portable filtering system specified above. Once the hydraulic power unit reservoirs are filled the hydraulic fluid shall be circulated by operating the kidney loop filter circuit a minimum of 4 hours, changing filters as**

they become contaminated. At the end of 4 hours the fluid cleanliness level shall be checked to verify it meets at least 14/11 in accordance with ISO 4406 and water content below 200 ppm. Hydraulic fluid shall continue to be circulated until the fluid meets the required cleanliness level. The complete hydraulic power system shall be bled to remove all air from the system. Care shall be taken to exclude as much air as possible during initial filling. The hydraulic cylinders shall be filled in the horizontal position with the piping connections up to allow air to escape, and the piping shall be filled in a manner that excludes as much air as possible. The system, once filled, shall be bled of air, operated, and periodically bled during the first week of operation to remove any air that might have been entrained in the system.

\*1

### 3.3 PAINTING

All exposed exterior surfaces of assemblies and equipment except stainless steel, synthetic rubber, and plastic, shall be shop primed and coated as specified in Section 09965 PAINTING: HYDRAULIC STRUCTURES unless the equipment is given a standard factory finish as allowed by other paragraphs of this specification. Insofar as is practicable, the complete coating system shall be applied to individual components and items before assembly to ensure complete coverage and maximum protection against corrosion. Equipment such as the pumps which have a factory-finished coating do not need to be recoated. Chips, scratches, and other damage to shop-applied painted surfaces shall be repainted in the field.

### 3.4 FIELD TESTS AND INSPECTIONS

#### 3.4.1 Field Testing

The Contracting Officer shall be given 2 weeks notice before any field testing is to be conducted. Any material, equipment, instruments, and personnel required for the tests shall be provided by the Contractor. Testing shall be conducted in the presence of the Contracting Officer unless waived in writing and then a certified field test report shall be submitted in accordance with paragraph SUBMITTALS. Testing shall be done under the direction of the erection engineer or manufacturer's representative.

#### 3.4.2 Proof Testing

The piping system shall be hydrostatically tested to not less than 125 percent of the design working pressure. Any equipment that might be damaged by this pressure shall be isolated or removed to prevent damage. The proof test pressure shall be maintained for 12 hours. All welded, flanged, and threaded connections shall be carefully examined for leakage, and all lines shall be inspected for evidence of deflection caused by inadequate anchorage. No leakage or deflection will be allowed.

#### 3.4.3 Final Acceptance Tests

In preparation for the final acceptance tests, and after completion of the installation and proof tests, the Contractor shall operate the hydraulic power system to prove acceptability. Preliminary tests shall be conducted

at minimum pressures and velocities until initial adjustments have been proven safe for normal operation. Details of all operations shall be constantly monitored for signs of impending trouble and corrections shall be made as necessary to prevent damage to the equipment. At such time as the Contracting Officer may direct, the Contractor shall conduct the following complete acceptance tests on the hydraulic power system for approval. Any deficiency or maladjustment disclosed by the tests shall be corrected immediately and the test repeated until satisfactory results are obtained. No subsequent tests will be permitted until all preceding tests have been completed satisfactorily. Upon completion of the final acceptance tests, the Contractor shall furnish a written statement that the hydraulic power system has been field tested and meets all operational requirements.

#### 3.4.3.1 Initial Start-Up

**\*1**

**The hydraulic reservoir shall be inspected to ensure that the fluid is at the proper level. The hydraulic pumps shall be test started using both the controls at the control console and the remote controls.** The pumps shall be inspected for proper operation and discharge pressure. **Pressure compensator and horsepower limiting features of the hydraulic pumps shall be set and verified.** The discharge pressure of each pump shall be read and recorded. The pressure relief valves shall be adjusted to limit the system pressure to the specified value. The unloading valves shall be adjusted. The hydraulic lines and components which are under pressure shall be inspected for evidence of leakage.

**\*1**

#### 3.4.3.2 Combined System Tests

Tests and inspections of the hydraulic power system shall be performed concurrently with the testing specified under other sections of these specifications which test the mechanism operated by the hydraulic system. The hydraulic system shall be tested by operating the mechanism through a minimum of four complete cycles. During each test operation, the hydraulic lines and components shall be inspected for evidence of leakage. The pressure in the supply and return lines for each direction of operation shall be read and recorded. Response of components to operation of applicable controls shall be inspected to ensure that all connections have been made properly. Flow control valves shall be checked and adjusted as required to conform to indicated operating time requirements.

#### 3.4.3.3 Test Reports

The Contractor shall prepare and complete test reports showing in detail the results of the field tests. The test reports shall include a detailed tabulation showing values of pressures, flow rates, and all adjustments recorded during the final tests, and adjustment and calibration of the entire system. During each test run, the following data and observations shall be recorded:

- a. Control operation
- b. Voltages

- c. Currents
- d. Pressures
- e. Speeds and times
- f. Flow control valve settings
- g. Alignment and operating clearances
- h. Excessive vibration, by component
- i. Temperature of motors and hydraulic fluid
- j. Pertinent observations regarding such events as unusual sounds, malfunctions or difficulties encountered, and adjustments required.

### 3.5 ERECTION ENGINEER

The Contractor shall obtain the services of an experienced erection engineer who is regularly employed by the hydraulic cylinder/power unit manufacturer to supervise the installation, start-up, adjustment and operation, and testing of the equipment provided. The erection engineer shall furnish a signed statement stating that the final installation and start-up of the hydraulic power system has been inspected, witnessed, and complies fully with the manufacturer's warranty requirements. The erection engineer shall also instruct the Government's operating staff members in the operation and maintenance features of the equipment.

-- End of Section --

SECTION TABLE OF CONTENTS

DIVISION 16 - ELECTRICAL

SECTION 16263

DIESEL-GENERATOR SET STATIONARY, WITH AUXILIARIES

04/99

PART 1 GENERAL

- 1.1 REFERENCES
- 1.2 SUBMITTALS
- 1.3 SYSTEM DESCRIPTION
  - 1.3.1 Engine-Generator Parameter Schedule
  - 1.3.2 Rated Output Capacity
  - 1.3.3 Power Ratings
  - 1.3.4 Transient Response
  - 1.2.5 Reliability and Durability
- 1.4 GENERAL REQUIREMENTS
  - 1.4.1 Engine-Generator Set
  - 1.4.2 Nameplates
  - 1.4.3 Personnel Safety Devices
  - 1.4.4 Verification of Dimensions
  - 1.4.5 Conformance to Codes and Standards
  - 1.4.6 Site Welding
  - 1.4.7 Vibration Limitation
  - 1.4.8 Vibration Isolation
  - 1.4.9 Seismic Requirements
  - 1.4.10 Fuel Consumption
  - 1.4.11 Starting Time Requirements
  - 1.4.12 Experience
  - 1.4.13 Field Engineer
- 1.5 STORAGE AND INSTALLATION
- 1.6 PAYMENT

PART 2 PRODUCTS

- 2.1 MATERIALS AND EQUIPMENT
  - 2.1.1 Filter Elements
  - 2.1.2 Instrument Transformers
  - 2.1.3 Pipe
  - 2.1.4 Pipe Hangers
  - 2.1.5 Electrical Enclosures
    - 2.1.5.1 Power Switchgear Assemblies
    - 2.1.5.2 Switchboards
    - 2.1.5.3 Panelboards
  - 2.1.6 Electric Motors
  - 2.1.7 Motor Controllers
- 2.2 ENGINE

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

- 2.3 FUEL SYSTEM
  - 2.3.1 Pumps
    - 2.3.1.1 Main Pump
    - 2.3.1.2 Auxiliary Fuel Pump
    - 2.3.1.3 Transfer and Overflow Pumps
  - 2.3.2 Strainer
  - 2.3.3 Fuel Filter
  - 2.3.4 Relief/Bypass Valve
  - 2.3.5 Solenoid Valve
  - 2.3.6 Check Valve
  - 2.3.7 Day Tank
    - 2.3.7.1 Drain Line
    - 2.3.7.2 Local Fuel Fill
    - 2.3.7.3 Float Switches
    - 2.3.7.4 Electronic Control Module (ECM)
    - 2.3.7.5 Arrangement
  - 2.3.8 Fuel Supply System
- 2.4 LUBRICATION
  - 2.4.1 Lube-Oil Filter
  - 2.4.2 Lube-Oil Sensors
- 2.5 COOLING
  - 2.5.1 Coolant Pumps
  - 2.5.2 Heat Exchanger
    - 2.5.2.1 Remote Radiator
  - 2.5.3 Thermostatic Control Valve
  - 2.5.4 Ductwork
  - 2.5.5 Temperature Sensors
- 2.6 SOUND LIMITATIONS
- 2.7 AIR INTAKE EQUIPMENT
- 2.8 EXHAUST SYSTEM
  - 2.8.1 Flexible Sections and Expansion Joints
  - 2.8.2 Exhaust Muffler
  - 2.8.3 Exhaust Piping
- 2.9 NOT USED
- 2.10 NOT USED
- 2.11 STARTING SYSTEM
  - 2.11.1 Controls
  - 2.11.2 Capacity
  - 2.11.3 Electrical Starting
    - 2.11.3.1 Battery
    - 2.11.3.2 Battery Charger
  - 2.11.4 Starting Aids
    - 2.11.4.1 NOT USED
    - 2.11.4.2 Jacket-Coolant Heaters
  - 2.11.5 Exerciser
- 2.12 GOVERNOR
  - 2.12.1 Governor Performance
- 2.13 GENERATOR
  - 2.13.1 Current Balance
  - 2.13.2 Voltage Balance
  - 2.13.3 Waveform
- 2.14 EXCITER
- 2.15 VOLTAGE REGULATOR
  - 2.15.1 Steady State Performance (Regulation or Voltage Droop)

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

- 2.16 GENERATOR ISOLATION AND PROTECTION
- 2.17 SAFETY SYSTEM
  - 2.17.1 Audible Signal
  - 2.17.2 Visual Signal
  - 2.17.3 Alarms and Action Logic
    - 2.17.3.1 Shutdown
    - 2.17.3.2 Problem
  - 2.17.4 Local Alarm Panel
  - 2.17.5 Time-Delay on Alarms
- 2.18 ENGINE GENERATOR SET CONTROLS AND INSTRUMENTATION
  - 2.18.1 Controls
  - 2.18.2 Engine Generator Set Metering and Status Indication
- 2.19 PANELS
  - 2.19.1 Enclosures
  - 2.19.2 Analog
  - 2.19.3 Parameter Display
- 2.20 AUTOMATIC ENGINE-GENERATOR-SET SYSTEM OPERATION
  - 2.20.1 Automatic Transfer Switch
  - 2.20.2 Monitoring and Transfer
- 2.21 MANUAL ENGINE-GENERATOR-SET SYSTEM OPERATION
- 2.22 BASE
- 2.23 THERMAL INSULATION
- 2.24 PAINTING AND FINISHING
- 2.25 FACTORY INSPECTION AND TESTS
  - 2.25.1 Factory Inspection
  - 2.25.2 Factory Tests

## PART 3 EXECUTION

- 3.1 GENERAL INSTALLATION
- 3.2 PIPING INSTALLATION
  - 3.2.1 Support
    - 3.2.1.1 Ceiling and Roof
    - 3.2.1.2 Wall
  - 3.2.2 Flanged Joints
  - 3.2.3 Cleaning
  - 3.2.4 Pipe Sleeves
- 3.3 ELECTRICAL INSTALLATION
  - 3.3.1 Vibration Isolation
- 3.4 FIELD PAINTING
- 3.5 ONSITE INSPECTION AND TESTS
  - 3.5.1 Test Conditions
    - 3.5.1.1 Data
    - 3.5.1.2 Power Factor
    - 3.5.1.3 Contractor Supplied Items
    - 3.5.1.4 Instruments
    - 3.5.1.5 Sequence
  - 3.5.2 Construction Tests
    - 3.5.2.1 Piping Test
    - 3.5.2.2 Electrical Equipment Tests
  - 3.5.3 Inspections
  - 3.5.4 Pre-operational Tests
    - 3.5.4.1 Protective Relays
    - 3.5.4.2 Insulation Test



McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

- 3.5.4.3 Engine-Generator Connection Coupling Test
- 3.5.5 Safety Run Test
- 3.5.6 Performance Tests
  - 3.5.6.1 Continuous Engine Load Run Test
  - 3.5.6.2 Voltage and Frequency Droop Test
  - 3.5.6.3 Voltage Regulator Range Test
  - 3.5.6.4 Governor Adjustment Range Test
  - 3.5.6.5 Frequency and Voltage Stability and Transient Response
- 3.5.7 Parallel Operation Test (Commercial Source)
- 3.5.8 Final Testing and Inspection
- 3.6 POSTED DATA AND INSTRUCTIONS
- 3.7 ONSITE TRAINING
- 3.8 ACCEPTANCE

-- End of Section Table of Contents --

## SECTION 16263

## DIESEL-GENERATOR SET STATIONARY, WITH AUXILIARIES

04/99

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

## AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

- |             |  |
|-------------|--|
| ANSI C12.11 | (1987; R 1993) Instrument Transformers for Revenue Metering, 10 kV BIL through 350 kV BIL (0.6 kV NSV through 69 kV NSV) |
| ANSI C39.1  | (1981; R 1992) Requirements for Electrical Analog Indicating Instruments   |

## AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

- |                   |  |
|-------------------|--|
| ASTM A 106        | (1999) Seamless Carbon Steel Pipe for High-Temperature Service                                     |
| ASTM A 181/A 181M | (2001) Carbon Steel Forgings for General-Purpose Piping  |
| ASTM A 234/A 234M | (2001a) Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperatures |
| ASTM D 975        | (1994) Diesel Fuel Oils  |

## ASME INTERNATIONAL (ASME)

- |             |   |
|-------------|---|
| ASME B16.3  | (1999) Malleable Iron Threaded Fittings                                 |
| ASME B16.5  | (1996; B16.5a) Pipe Flanges and Flanged Fittings NPS 1/2 thru NPS 24    |
| ASME B16.11 | (1996) Forged Fittings, Socket-Welding and Threaded                     |
| ASME B31.1  | (2001) Power Piping   |
| ASME BPV IX | (1998) Boiler and Pressure Vessel Code; Section IX, Welding and Brazing |

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

## Qualifications

## ELECTRICAL GENERATING SYSTEMS ASSOCIATION (EGSA)

EGSA 101P (1995a) Engine Driven Generator Sets

## INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE C2 (1997) National Electrical Safety Code

IEEE ANSI/IEEE C57.13.1 (1981; R 1992) IEEE Guide for Field Testing of Relaying Current Transformers

IEEE Std 1 (1986; R 2000) General Principles for Temperature Limits in the Rating of Electric Equipment and for the Evaluation of Electrical Insulation

IEEE Std 43 (1974; R 2000) Testing Insulation Resistance of Rotating Machinery

IEEE Std 81 (1983) Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System (Part 1)

IEEE Std 100 (1996) IEEE Standard Dictionary of Electrical and Electronics Terms

IEEE Std 120 (1989) Electrical Measurements in Power Circuits

IEEE Std 115 (1995) Test Procedures for Synchronous Machines

IEEE Std 519 (1992) Harmonic Control in Electrical Power systems

## MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS INDUSTRY (MSS)

MSS SP-58 (1993) Pipe Hangers and Supports - Materials, Design and Manufacture

MSS SP-69 (1996) Pipe Hangers and Supports - Selection and Application

MSS SP-80 (1997) Bronze Gate, Globe, Angle and Check Valves

## NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA ICS 2 (2000) Industrial Control and Systems Controllers, Contactors, and Overload

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

Relays Rated Not More Than 2,000 Volts AC  
or 750 Volts DC

NEMA ICS 6	(1993) Industrial Control and Systems, Enclosures
NEMA MG 1	(1998; Rev 1; Rev 2; Rev 3 Rev 4) Motors and Generators
NEMA PB 1	(1997) Panelboards
NEMA PB 2	(1995) Deadfront Distribution Switchboards
NEMA SG 5	(1995) Power Switchgear Assemblies

## NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 30	(2000; Errata; TIA 96-2) Flammable and Combustible Liquids Code
NFPA 37	(1998) Installation and Use of Stationary Combustion Engines and Gas Turbines
NFPA 70	(2002) National Electrical Code
NFPA 99	(1999) Health Care Facilities
NFPA 110	(1996) Emergency and Standby Power Systems

## SOCIETY OF AUTOMOTIVE ENGINEERS (SAE)

SAE J 537	(2000) Storage Batteries
-----------	--------------------------

## UNDERWRITERS LABORATORIES (UL)

UL 142	(1993) Steel Aboveground Tanks for Flammable and Combustible Liquids
UL 508	(1999) Industrial Control Equipment
UL 1236	(1994; Rev thru Dec 1999) Battery Chargers for Charging Engine-Starter Batteries

## 1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01335 SUBMITTAL PROCEDURES:

SD-01 Data

Equipment and Performance; GA, ED.

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

Calculations of the engine and generator output power capability, including efficiency and parasitic load data.

Sound Power Level; GA, ED.

Sound power level data for the packaged unit operating at 100% load in a free field environment. The data should demonstrate compliance with the sound limitation requirements of this specification.

Harmonic and Non-linear Load Capability; FIO.

Description of the generator features which mitigate the effects of the non-linear loads listed.

Day Tank ; GA, ED.

Product data for the day tank shall include product features, capacity, specification and required listing.

Power Factor Capability Curve; FIO.

The generator capability curve showing generator kVA output capability (kW vs. kvar) for both leading and lagging power factors ranging from 0 to 1.0.

Heat Rejected To Engine-Generator Space; GA, ED.

Manufacturers data to quantify heat rejected to the space with the engine generator set at rated capacity shall be submitted before installation of ventilation equipment.

Cooling Equipment and Performance; GA, ED.

A letter which certifies that the engine-generator set and cooling system function properly in the ambient temperature specified.

- a. The maximum allowable inlet temperature of the coolant fluid.
- b. The minimum allowable inlet temperature of the coolant fluid.
- c. The maximum allowable temperature rise in the coolant fluid through the engine.

Alarm Set Points; GA, ED.

The magnitude of monitored values which define alarm or action set points, and the tolerance (plus and/or minus) at which the devices activate the alarm or action for items contained within the alarm panels.

Generator Data; GA, ED.

Manufacturer's standard data for each generator (prototype data at the specified rating or above is acceptable) listing the following information:

Direct-Axis subtransient reactance (per unit).

The generator kW rating and short circuit current capacity (both symmetric and asymmetric)

Manufacturer's Catalog; GA, ED.

Manufacturer's standard catalog data describing and depicting each engine-generator set and all ancillary equipment in sufficient detail to demonstrate complete specification compliance.

Site Welding; FIO.

A copy of qualifying procedures and a list of names and identification symbols of qualified welders and welding operators.

Spare Parts; FIO.

A complete list of spare parts for each piece of equipment and a complete list of all material and supplies needed for continued operation. Lists shall include supply source and current prices. Each list shall be separated into two parts: those elements recommended by the manufacturer to be replaced after 3 years of service and the remaining elements.

Training; GA, RE.

A letter giving the date proposed for conducting the onsite training course, the agenda of instruction, a description of the video taping service to be provided, and the kind and quality of the tape to be left with the Contracting Officer at the end of the instructional period.

Battery Charger; GA, ED.

Battery charger sizing calculations.

Vibration-Isolation; FIO.

Vibration isolation system performance data for the range of frequencies generated by the engine-generator set during operation from no load to full load and the maximum vibration transmitted to the floor. Description of seismic qualification of the engine-generator mounting, base, and vibration isolation.

#### SD-04 Drawings

Layout and Shop Drawings; GA, ED.

Drawings shall include the following:

- a. Base-mounted equipment, complete with base and attachments, including anchor bolt template and recommended clearances for maintenance and operation.
- b. Complete starting system.

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

- c. Complete fuel system.
- d. Complete cooling system.
- e. Complete exhaust system.
- f. Layout of relays, breakers, programmable controllers, switchgear, and switches including applicable single line and wiring diagrams with written description of sequence of operation and the instrumentation provided.
- g. The complete lubrication system, including piping, pumps, strainers, filters, heat exchangers for lube oil, and turbocharger cooling controls and wiring.
- h. Location, type, and description of vibration isolation devices for all applications.
- i. The safety system, together with a detailed description of how it is to work. Wiring schematics, safety devices with a listing of their normal ranges, and alarm and shutdown values (to include operation parameters such as pressures, temperatures voltages, currents, and speeds) shall be included.
- j. One-line schematic and wiring diagrams of the generator, exciter, regulator, governor, and instrumentation.
- k. Layout of each panel.
- l. Mounting and support for each panel and major piece of electrical equipment.
- m. Engine-generator set lifting points and rigging instructions.

As-Built Drawings; GA, RE.

Drawings which accurately depict the as-built configuration of the installation, upon acceptance of the diesel-generator set installation. Layout drawings shall be revised to reflect the as-built conditions and shall be submitted with the as-built drawings.

SD-06 Instructions

Posted Data; GA, RE.

Posted data including wiring and control diagrams showing the key mechanical and electrical control elements and a complete layout of the entire system.

Instructions; GA, ED.

Instructions including: the manufacturers pre-start checklist and precautions; startup procedures for test-mode, manual-start mode, and automatic-start mode (as applicable); running checks, procedures, and

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

precautions; and shutdown procedures, checks, and precautions. Instructions shall include procedures for interrelated equipment (such as heat recovery systems, co-generation, load-shedding, and automatic transfer switches). Instructions shall be weatherproof, laminated in plastic, and posted where directed.

## SD-08 Statements

Component Manufacturer; GA, RE.

Each component manufacturer has a minimum of 3 years experience in the manufacture, assembly, and sale of components used with stationary diesel engine-generator sets for commercial and industrial use.

Manufacturer/Assembler; GA, RE.

The engine-generator set manufacturer/assembler has a minimum of 3 years experience in the manufacture, assembly, and sale of stationary diesel engine-generator sets for commercial and industrial use.

Cooling System; GA, ED.

Certification that the engine-generator set and cooling system function properly in the ambient temperatures specified.

Field Engineer; GA, RE.

A letter listing the qualifications, schools, formal training, and experience of the field engineer.

Welder Qualification; GA, RE.

A letter listing the welder qualifying procedures for each welder, complete with supporting data such as test procedures used, what was tested to, and a list of the names of all welders and their identification symbols.

Installation Procedures; GA, ED.

A copy of the manufacturer's installation procedures and a detailed description of the manufacturer's recommended break-in procedure.

## SD-09 Reports

Factory Inspection and Tests; GA, ED.

Six Complete reproducible copies of the factory inspection result on the checklist format specified in paragraph FACTORY INSPECTION AND TESTS.

Factory Tests; GA, RE.

- a. A letter giving notice of the proposed dates of factory inspections and tests at least 14 days prior to beginning tests.
- b. A detailed description of the manufacturer's procedures for



## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

factory tests at least 14 days prior to beginning tests.

- c. Six copies of the Factory Test data described below in 8-1/2 x 11 inch binders having a minimum of 3 rings from which material may readily be removed and replaced, including a separate section for each test. Sections shall be separated by heavy plastic dividers with tabs. Data plots shall be full size (8-1/2 x 11 inch minimum), showing grid lines, with full resolution.
  - (1) A detailed description of the procedures for factory tests.
  - (2) A list of equipment used, with calibration certifications.
  - (3) A copy of measurements taken, with required plots and graphs.
  - (4) The date of testing.
  - (5) A list of the parameters verified.
  - (6) The condition specified for the parameter.
  - (7) The test results, signed and dated.
  - (8) A description of adjustments made.

On Site Tests; GA, RE.

- a. A letter giving notice of the proposed dates of onsite inspections and tests at least 14 days prior to beginning tests.
- b. A detailed description of the Contractor's procedures for onsite tests including the test plan and a listing of equipment necessary to perform the tests. Submission shall be at least 10 days prior to beginning tests.
- c. Six copies of the onsite test data described below in 8-1/2 x 11 inch binders having a minimum of 3 rings from which material may readily be removed and replaced, including a separate section for each test. Sections shall be separated by heavy plastic dividers with tabs. Data plots shall be full size (8-1/2 x 11 inch minimum), showing grid lines, with full resolution.
  - (1) A detailed description of the procedures for onsite tests.
  - (2) A list of equipment used, with calibration certifications.
  - (3) A copy of measurements taken, with required plots and graphs.
  - (4) The date of testing.
  - (5) A list of the parameters verified.
  - (6) The condition specified for the parameter.

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

(7) The test results, signed and dated.

(8) A description of adjustments made.

## SD-13 Certificates

Torsional Vibration; GA, ED.

Torsional analysis including prototype testing or and calculations which certify and demonstrate that no damaging or dangerous torsional vibrations will occur when the prime mover is connected to the generator, at synchronous speeds,  $\pm 10\%$ .

Prototype Tests; FIO.

Manufacturer's standard certification that prototype tests were performed for the generator model proposed.

Reliability and Durability; GA, ED.

A reliability and durability certification letter from the manufacturer and assembler to prove that existing facilities are and have been successfully utilizing the same components proposed to meet this specification in similar service. Certification may be based on components, i.e. engines used with different models of generators and generators used with different engines, and does not exclude annual technological improvements made by a manufacturer in the basic standard-model component on which experience was obtained, provided parts interchangeability has not been substantially affected and the current standard model meets the performance requirements specified. Provide a list with the name of the installations, completion dates, and name and telephone number of a point of contact.

Emissions; FIO.

A certification from the engine manufacturer stating that the engine exhaust emissions meet the federal, state, and local regulations and restrictions specified. At a minimum this certification shall include emission factors for criteria pollutants including nitrogen oxides, carbon monoxide, particulate matter, sulfur dioxide, non-methane hydrocarbon, and for hazardous air pollutants (HPAs).

Sound Limitation; FIO

A certification from the manufacturer stating that the sound emissions meet the specification.

Site Visit; FIO.

A letter stating the date the site was visited and listing discrepancies found.

Flywheel Balance; GA, ED.

A certification stating that the flywheel has been statically and

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

dynamically balanced and is capable of being rotated at 125% of rated speed without vibration or damage.

Standards Compliance; GA, RE.

A certification stating that where materials or equipment are specified to comply with requirements of UL, written proof of such compliance has been obtained. The label or listing of the specified agency, or a written certificate from an approved, nationally recognized testing organization equipped to perform such services, stating that the items have been tested and conform to the requirements and testing methods of the specified agency are acceptable as proof.

Functional Facilities; GA, RE.

A letter certifying that all facilities are complete and functional; that each system is fully functional; and that each item of equipment is complete, free from damage, adjusted, and ready for beneficial use.

SD-19 Operation and Maintenance Manuals

Operation Manual; GA, ED.

Six copies of the operation manual (approved prior to commencing onsite tests) in 8-1/2 x 11 inch binders, having a minimum of 3 rings from which material may readily be removed and replaced, including a separate section for each system or subsystem. Sections shall be separated by heavy plastic dividers with tabs which identify the material in the section. Drawings shall be folded blue lines, with the title block visible, and placed in 8-1/2 x 11 inch plastic pockets with reinforced holes. One full size reproducible mylar of each drawing shall accompany the booklets. Mylars shall be rolled and placed in a heavy cardboard tube with threaded caps on each end. The manual shall include: step-by-step procedures for system startup, operation, and shutdown; drawings, diagrams, and single-line schematics to illustrate and define the electrical, mechanical, and hydraulic systems together with their controls, alarms, and safety systems and the manufacturer's name, model number, and a description of equipment in the system. The instructions shall include procedures for interface and interaction with related systems to include automatic transfer switches. Each booklet shall include a CDROM containing an ASCII file of the procedures.

Maintenance Manual; GA, ED.

Six copies of the maintenance manual containing the information described below in 8-1/2 x 11 inch binders having a minimum of three rings from which material may readily be removed and replaced, including a separate section for each item listed. Each section shall be separated by a heavy plastic divider with tabs. Drawings shall be folded, with the title block visible, and placed in plastic pockets with reinforced holes.

a. Procedures for each routine maintenance item.

Procedures for troubleshooting.

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

Factory-service, take-down overhaul, and repair service manuals, with parts lists.

- b. A copy of the posted instructions.
- c. A component list which includes the manufacturer's name, address, type or style, model or serial number, rating, and catalog number for the major components specified for nameplates.

Six complete reproducible copies of the final relay and protective device settings. The settings shall be recorded with the name of the company and individual responsible for their accuracy.

Special Tools; GA, ED.

Two complete sets of special tools required for maintenance (except for electronic governor handset). Special tools are those that only the manufacturer provides, for special purposes, or to reach otherwise inaccessible parts. The tools shall be supplied complete with a suitable tool box. One handset shall be provided for each electronic governor when required to indicate and/or change governor response settings.

Filters; GA, RE

Two complete sets of filters shall be supplied in a suitable storage box. These filters shall be in addition to filters replaced after testing.

### 1.3 SYSTEM DESCRIPTION

Each engine-generator set shall be provided and installed complete and totally functional, with all necessary ancillary equipment to include: air filtration; starting system; generator controls, protection, and isolation; instrumentation; lubrication; fuel system; cooling system; and engine exhaust system. Each engine-generator set shall satisfy the requirements specified in the Engine-Generator Parameter Schedule.

#### 1.3.1 Engine-Generator Parameter Schedule

##### ENGINE-GENERATOR PARAMETER SCHEDULE

Power Rating	Emergency Standby
Overload Capacity (Prime applications only)	110% of Service Load for 1 hour in 12 consecutive hours
Service Load	450 kVA (maximum)
Motor Starting kVA (Max.)	1350 kVA
Power Factor	0.8 lagging
Engine-Generator Applications	stand-alone

## ENGINE-GENERATOR PARAMETER SCHEDULE

Maximum Speed	1800 rpm
Heat Exchanger Type	remote radiator shell-tube
Governor Type	Isochronous
Frequency Bandwidth (steady state)	$\pm 0.25\%$
Voltage Regulation (No Load to Full Load) (Stand alone applications)	$\pm 2\%$ (maximum)
Voltage Bandwidth (steady state)	$\pm 2\%$
Frequency	60 Hz
Voltage	480/277 volts
Phases	3 Phase, Wye
Max Step Load Increase	25% of Service Load
Transient Recovery Time with Step Load Increase (Voltage)	6 seconds
Transient Recovery Time with Step Load Increase (Frequency)	6 seconds
Maximum Voltage Deviation with Step Load Increase	10 % of rated voltage
Maximum Frequency Deviation with Step Load Increase	5% of rated frequency
Max Step Load Decrease (without shutdown)	100% of Service Load
Max Time to Start and be Ready to Assume Load	8 seconds
Max Summer Outdoor Temp (Ambient)	105 degrees
Min Winter Outdoor Temp (Ambient)	5 degrees

## ENGINE-GENERATOR PARAMETER SCHEDULE

Installation Elevation

443 ft. above sea level

## 1.3.2 Rated Output Capacity

Each engine-generator-set shall provide power equal to the sum of Service Load plus the machine's efficiency loss and associated ancillary equipment loads. Rated output capacity shall also consider engine and/or generator oversizing required to meet requirements in paragraph Engine-Generator Parameter Schedule.

## 1.3.3 Power Ratings

Power ratings shall be in accordance with EGSA 101P.

## 1.3.4 Transient Response

The engine-generator set governor and voltage regulator shall cause the engine-generator set to respond to the maximum step load changes such that output voltage and frequency recover to and stabilize within the operational bandwidth within the transient recovery time. The engine-generator set shall respond to maximum step load changes such that the maximum voltage and frequency deviations from bandwidth are not exceeded.

## 1.2.5 Reliability and Durability

Each standby engine-generator set shall have both an engine and a generator capable of delivering the specified power on a standby basis with an anticipated mean time between overhauls of no less than 5,000 hours operating with a load factor of 70%. Two like engines and two like generators shall be cited that have performed satisfactorily in a stationary power plant, independent and separate from the physical location of the manufacturer's and assembler's facilities, for standby without any failure to start, including all periodic exercise. Each like engine and generator shall have had no failures resulting in downtime for repairs in excess of 72 hours during two consecutive years of service. Like engines shall be of the same model, speed, bore, stroke, number and configuration of cylinders, and rated output capacity. Like generators shall be of the same model, speed, pitch, cooling, exciter, voltage regulator and rated output capacity.

## 1.4 GENERAL REQUIREMENTS

## 1.4.1 Engine-Generator Set

Each set shall consist of one engine, one generator, and one exciter mounted, assembled, and aligned on one base; and other necessary ancillary equipment which may be mounted separately. Sets having a capacity of 750 kW or smaller shall be assembled and attached to the base prior to shipping. Sets over 750 kW capacity may be shipped in sections. Each set component shall be environmentally suitable for the location shown and shall be the manufacturer's standard product offered in catalogs for

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

commercial or industrial use. Any nonstandard products or components and the reason for their use shall be specifically identified in paragraph SUBMITTALS.

## 1.4.2 Nameplates

Each major component of this specification shall have the manufacturer's name, type or style, model or serial number and rating on a plate secured to the equipment. As a minimum, nameplates shall be provided for:

Engine	Relays
Generator	Transformers (CT & PT)
Regulators	Day tanks
Pumps and pump motors	Governors
Generator Breaker	Heat exchangers (other than base
Economizers	mounted)

Where the following equipment is not provided as a standard component by the diesel engine generator set manufacturer, the nameplate information may be provided in the maintenance manual in lieu of nameplates.

Battery charger	Heaters
Switchboards	Exhaust mufflers
Switchgear	Silencers
Battery	Exciters

## 1.4.3 Personnel Safety Devices

Exposed moving parts, parts that produce high operating temperatures, parts which may be electrically energized, and parts that may be a hazard to operating personnel shall be insulated, fully enclosed, guarded, or fitted with other types of safety devices. The safety devices shall be installed so that proper operation of the equipment is not impaired.

## 1.4.4 Verification of Dimensions

Before performing any work, the premises shall be visited and all details of the work verified. The Contracting Officer shall be advised in writing of any discrepancies.

## 1.4.5 Conformance to Codes and Standards

Where equipment is specified to conform to requirements of any code or standard such as UL, NEMA, etc., the design, fabrication and installation shall also conform to the code.

## 1.4.6 Site Welding

Structural members shall be welded in accordance with Section 05090 WELDING, STRUCTURAL. For all other welding, procedures and welders shall be qualified in accordance with ASME BPV IX. Welding procedures qualified by others, and welders and welding operators qualified by a previously qualified employer may be accepted as permitted by ASME B31.1. Welder

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

qualification tests shall be performed for each welder whose qualifications are not in compliance with the referenced standards. The Contracting Officer shall be notified 24 hours in advance of qualification tests. The qualification tests shall be performed at the work site if practical. The welder or welding operator shall apply his assigned symbol near each weld he makes as a permanent record.

## 1.4.7 Vibration Limitation

The maximum engine-generator set vibration in the horizontal, vertical, and axial directions shall be limited to 6 mils (peak-peak RMS), with an overall velocity limit of 0.95 inches/second RMS, for all speeds through 110% of rated speed.

## 1.4.8 Vibration Isolation

The engine-generator set shall be provided with a vibration-isolation system in accordance with the manufacturer's standard recommendation. Vibration-isolation systems shall be designed and qualified (as an integral part of the base and mounting system in accordance with the seismic parameters specified. Where the vibration-isolation system does not secure the base to the structure floor or unit foundation, seismic restraints shall be provided in accordance with the seismic parameters specified.

## 1.4.9 Seismic Requirements

Seismic requirements shall be in accordance with Sections 13080 SEISMIC PROTECTION FOR MISCELLANEOUS EQUIPMENT, 15070 SEISMIC PROTECTION FOR MECHANICAL EQUIPMENT, and 16070 SEISMIC PROTECTION FOR ELECTRICAL EQUIPMENT.

## 1.4.10 Fuel Consumption

Engine fuel consumption shall not exceed the following maximum limits based on the conditions listed below.

Size Range Net kW	% of Rated Output Capacity	Fuel Usage LBS./kWH
300 - 999	75 and 100	0.575
	50	0.600

## Conditions:

- a. Net kW of the Set corrected for engine auxiliaries that are electrically driven, where kW is electrical kilowatt hours.
- b. 19,350 Btu per pound high-heat value for fuel used.
- c. Sea level operation.
- d. Intake-air temperature not over 90 degrees F.
- e. Barometric pressure of intake air not less than 28-1/4 inches of



## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

mercury.

#### 1.4.11 Starting Time Requirements

Upon receipt of a signal to start, each engine generator set will start, reach rated frequency and voltage and be ready to assume load within the time specified. For standby sets used in emergency power applications, each engine generator set will start, reach rated frequency and voltage, and power will be supplied to the load terminals of the automatic transfer switch within the starting time specified.

#### 1.4.12 Experience

Each component manufacturer shall have a minimum of 3 years experience in the manufacture, assembly and sale of components used with stationary diesel engine-generator sets for commercial and industrial use. The engine-generator set manufacturer/assembler shall have a minimum of 3 years experience in the manufacture, assembly and sale of stationary diesel engine-generator sets for commercial and industrial use.

#### 1.4.13 Field Engineer

The engine-generator set manufacturer or assembler shall furnish a qualified field engineer to supervise the complete installation of the engine-generator set, assist in the performance of the onsite tests, and instruct personnel as to the operational and maintenance features of the equipment. The field engineer shall have attended the engine generator manufacturer's training courses on installation and operation and maintenance of engine generator sets.

### 1.5 STORAGE AND INSTALLATION

The Contractor shall properly protect material and equipment, in accordance with the manufacturers recommended storage procedures, before, during, and after installation. Stored items shall be protected from the weather and contamination. During installation, piping and similar openings shall be capped to keep out dirt and other foreign matter.

### 1.6 PAYMENT

No separate payment or direct payment will be made for the work covered under this section. Any such work shall be considered incidental to the applicable bid item to which the work pertains.

## PART 2 PRODUCTS

### 2.1 MATERIALS AND EQUIPMENT

#### 2.1.1 Filter Elements

Fuel-oil, lubricating-oil, and combustion-air filter elements shall be manufacturer's standard.

#### 2.1.2 Instrument Transformers

ANSI C12.11.

#### 2.1.3 Pipe

Fuel piping external to the engine-generator set shall be in accordance with Section 13202 Fuel Storage Systems. Unless otherwise indicated on the contract drawings the piping shall be as follows.

ASTM A 53, or ASTM A 106 steel pipe. Pipe smaller than 2 inches shall be Schedule 80. Pipe 2 inches and larger shall be Schedule 40.

- a. Flanges and Flanged Fittings: ASTM A 181/A 181M, Class 60, or ASME B16.5, Grade 1, Class 150.
- b. Pipe Welding Fittings: ASTM A 234/A 234M, Grade WPB or WPC, Class 150 or ASME B16.11, 3000 lb.
- c. Threaded Fittings: ASME B16.3, Class 150.
- d. Valves: MSS SP-80, Class 150.
- e. Gaskets: Manufacturer's standard.

#### 2.1.4 Pipe Hangers

MSS SP-58 and MSS SP-69.

#### 2.1.5 Electrical Enclosures

NEMA ICS 6.

##### 2.1.5.1 Power Switchgear Assemblies

NEMA SG 5.

##### 2.1.5.2 Switchboards

NEMA PB 2.

##### 2.1.5.3 Panelboards

NEMA PB 1.

#### 2.1.6 Electric Motors

Electric motors shall conform to the requirements of NEMA MG 1. Motors shall have sealed ball bearings and a maximum speed of 1800 rpm. Motors used indoors shall have drip-proof frames; those used outside shall be totally enclosed. Alternating current motors larger than 1/2 Hp shall be of the squirrel-cage induction type for operation on 208 volts or higher, 60 Hz, and three-phase power. Alternating current motors 1/2 Hp or smaller, shall be suitable for operation on 120 volts, 60 Hz, and single-phase power. Direct current motors shall be suitable for operation on 125 volts.

### 2.1.7 Motor Controllers

Motor controllers and starters shall conform to the requirements of NFPA 70 and NEMA ICS 2.

### 2.2 ENGINE

Each engine shall operate on No. 2-D diesel fuel conforming to ASTM D 975, shall be designed for stationary applications and shall be complete with ancillaries. The engine shall be a standard production model described in the manufacturer's catalog. The engine shall be naturally aspirated, supercharged, or turbocharged. The engine shall be 4-stroke-cycle and compression-ignition type. The engine shall be vertical in-line, V- or opposed-piston type, with a solid cast block or individually cast cylinders. The engine shall have a minimum of 12 cylinders. Each block shall have a coolant drain port. Each engine shall be equipped with an overspeed sensor.

### 2.3 FUEL SYSTEM

The entire fuel system for the engine-generator set shall conform to the requirements of NFPA 30 , NFPA 37, 13202 FUEL STORAGE SYSTEM and contain the following elements.

#### 2.3.1 Pumps

##### 2.3.1.1 Main Pump

The engine shall be provided with an engine driven pump. The pump shall supply fuel from the day tank at a minimum rate sufficient to provide the amount of fuel required to meet the performance indicated within the parameter schedule. The fuel flow rate shall be based on meeting the load requirements and all necessary recirculation.

##### 2.3.1.2 Auxiliary Fuel Pump

Auxiliary fuel pump shall be provided to maintain the required engine fuel pressure in the event the main pump fails. The auxiliary pump shall be driven by a dc electric motor powered by the starting/station batteries. The auxiliary pump shall be automatically actuated by a pressure-detecting device.

##### 2.3.1.3 Transfer and Overflow Pumps

The day tank shall be equipped with one transfer pump to retrieve fuel from the fuel storage tank. The transfer pump shall operate when the liquid level in the day tank goes below 30 percent capacity and continue to operate until 90 percent capacity is reached. The transfer pump shall be mounted on the day tank. Additionally the day tank will be equipped with one overflow pump to return fuel back to the fuel storage tank. The return pump shall operate when liquid level in the day tank reaches 95 percent capacity and continue to operate until the liquid level returns to 90 percent capacity. The overflow pump can either be mounted on the day tank

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

or in the return line. Transfer pump shall be 2 gpm gear pump with sufficient lift to transfer fuel as described above for the system indicated on the contract plans. Overflow pump shall be 4 gpm gear pump with sufficient lift to transfer fuel as described above for the system indicated on the contract plans. Each pump shall have at least a 1/3 HP motor capable of operating on 115 volts, 1 phase, 60 Hz.

## 2.3.2 Strainer

Strainer shall meet the requirements specified in Section 13202 FUEL STORAGE SYSTEMS.

## 2.3.3 Fuel Filter

A minimum of one full-flow fuel filter shall be provided for engine. The filter shall be readily accessible and capable of being changed without disconnecting the piping or disturbing other components. The filter shall have inlet and outlet connections plainly marked.

## 2.3.4 Relief/Bypass Valve

A relief/bypass valve shall be provided to regulate pressure in the fuel supply line from the day tank, return excess fuel to the day tank to prevent the build-up of excessive pressure in the fuel line. Appropriate relief/bypass valves shall be provided to prevent damage to transfer pumps and piping connect to the day tank. All relief/bypass valves Section 13202 FUEL STORAGE SYSTEMS, paragraph PIPING COMPONENTS, sub-paragraph VALVES.

## 2.3.5 Solenoid Valve

Solenoid valve shall meet the requirements of Section 13202 FUEL STORAGE SYSTEMS, paragraph PIPING COMPONENTS, sub-paragraph VALVES. The valve shall open when the liquid level in the day tank goes below 30 percent capacity and continue to close when 90 percent capacity is reached. The valve shall fail closed.

## 2.3.6 Check Valve

Check valves shall meet the requirements of The valve shall meet the requirements of Section 13202 FUEL STORAGE SYSTEMS, paragraph PIPING COMPONENTS, sub-paragraph VALVES.

## 2.3.7 Day Tank

A double wall remote day tank shall be provided that has a total capacity of 60 gal in primary tank. Secondary containment shall 150 percent capacity provided by the primary tank. Day tank shall be UL 142 listed. Day tank shall have an electronic control module. Each day tank shall be provided with connections for fuel supply line, equipment fuel supply and return lines, fuel overflow line, local fuel fill port, gauge, vent line, drain line, and float switch assemblies for control. A fuel return line cooler shall be provided as recommended by the manufacturer and assembler. The temperature of the fuel returning to the day tank shall be below the flash point of the fuel. The fuel fill line shall be accessible without opening

the enclosure.

#### 2.3.7.1 Drain Line

Each day tank drain line shall be accessible and equipped with a shutoff valve. Self-supporting day tanks shall be arranged to allow drainage into a 12 inch tall bucket.

#### 2.3.7.2 Local Fuel Fill

Local fuel fill port on the day tank shall be provided with a screw-on cap.

#### 2.3.7.3 Float Switches

- a. Each day tank shall have a float-switch assemblies to perform the following functions:

- (1) Signal the start of fuel flow into the day tank when the fuel level is at the "Low liquid" level mark, 30% of the rated tank capacity.
- (2) Signal the stop of fuel flow into the day tank when the fuel level is at 90% of the rated tank capacity.
- (3) Signal the "Overfill liquid level" alarm at 95% of the rated tank capacity.
- (4) Signal the "Low liquid level" alarm at 30% of the rated tank capacity.
- (5) Signal the "Critically low liquid level" alarm at less than 30% of the rated tank capacity.

#### 2.3.7.4 Electronic Control Module (ECM)

The electronic control module shall be UL 508 listed and have the following features.

- (1) LED Display showing
  - a. Unit status (on/off/standby)
  - b. Transfer pump status (running/standby)
  - c. Liquid level in primary tank
  - d. Alarm Conditions
    1. High liquid level
    2. Low liquid level
    3. Critically low liquid level
    4. Liquid in secondary containment
    5. ECM status
- (2) Manual Controls, (on/off/test)
- (3) Automatic Controls
  - a. Open the solenoid valve on the fuel supply line from the fuel storage tank on low liquid alarm.

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

- b. Start supply transfer pump on low liquid level alarm
- c. Stop supply transfer pump at 90 percent liquid level
- d. Close the solenoid valve on the fuel supply line from the fuel storage tank at 90 percent liquid level.
- e. Start return transfer pump on overfill liquid level alarm
- f. Stop return transfer pump when liquid level returns to 90 percent.
- g. Send signal to the Control and Instrumentation System specified in Section 16900 that attention is required at the day tank on overfill and critically low liquid levels alarm conditions.
- h. Send signal to the Control and Instrumentation System specified in Section 16900 that attention is required at the day tank when liquid is sensed in the containment reservoir.

## 2.3.7.5 Arrangement

The fuel supply and return line from the day tank to the manufacturer's standard engine connection shall be welded pipe in accordance with Section 13202 FUEL STORAGE SYSTEMS.

## 2.3.8 Fuel Supply System

The fuel supply and return from the main storage of fuel to the day tank shall be as specified in Section 13202 FUEL STORAGE SYSTEMS.

## 2.4 LUBRICATION

Each engine shall have a separate lube-oil system conforming to NFPA 30 and NFPA 37. Each system shall be pressurized by engine-driven pumps. System pressure shall be regulated as recommended by the engine manufacturer. A pressure relief valve shall be provided on the crankcase for closed systems. The crankcase shall be vented in accordance with the manufacturer's recommendation except that it shall not be vented to the engine exhaust system. Crankcase breathers, if provided on engines installed in buildings or enclosures, shall be piped to vent to the outside. The system shall be readily accessible for service such as draining, refilling, etc. Each system shall permit addition of oil and have oil-level indication with the set operating. The system shall utilize an oil cooler as recommended by the engine manufacturer.

## 2.4.1 Lube-Oil Filter

One full-flow filter shall be provided for each pump. The filter shall be readily accessible and capable of being changed without disconnecting the piping or disturbing other components. The filter shall have inlet and outlet connections plainly marked.

## 2.4.2 Lube-Oil Sensors

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

Each engine shall be equipped with lube-oil pressure sensors. Pressure sensors shall be located downstream of the filters and provide signals for required indication and alarms.

## 2.5 COOLING

Each engine shall have its own cooling system. Each system shall operate automatically while its engine is running. The cooling system coolant shall use a combination of water and ethylene-glycol sufficient for freeze protection at the minimum winter outdoor temperature specified. The maximum temperature rise of the coolant across each engine shall not exceed that recommended and submitted in paragraph SUBMITTALS.

### 2.5.1 Coolant Pumps

Coolant pumps shall be the centrifugal type. Each engine shall have an engine-driven primary pump. Secondary pumps shall be electric motor driven and have automatic controllers.

### 2.5.2 Heat Exchanger

Each heat exchanger shall be of a size and capacity to limit the maximum allowable temperature rise in the coolant across the engine to that recommended and submitted in paragraph SUBMITTALS for the maximum summer outdoor design temperature and site elevation. Each heat exchanger shall be corrosion resistant, suitable for service in ambient conditions of application.

#### 2.5.2.1 Remote Radiator

Heat exchanger may be factory coated with corrosive resistant film, provided that correction measures are taken to restore the heat rejection capability of the radiator to the initial design requirement via oversizing, or other compensating methods. Internal surfaces shall be compatible with liquid fluid coolant used. Materials and coolant are subject to approval by the Contracting Officer. Heat exchangers shall be pressure type incorporating a pressure valve, vacuum valve and a cap. Caps shall be designed for pressure relief prior to removal. Heat exchanger and the entire cooling system shall be capable of withstanding a minimum pressure of 15 psi. Heat exchanger shall have at least two tapped holes; one tapped hole shall be equipped with a drain cock, the rest shall be plugged. Heat exchanger shall be equipped an AC electric motor driven fan that has sufficient capacity to reject required heat from the coolant to the exterior of Control Building "B". The fan shall have sufficient power to overcome static pressure losses through the heat exchanger and the indicated duct work, louvers, etc. The heat exchanger shall be installed with Vibration-Isolation to separated it from the building structure.

### 2.5.3 Thermostatic Control Valve

A modulating type, thermostatic control valve shall be provided in the coolant system to maintain the coolant temperature range submitted in paragraph SUBMITTALS.

## 2.5.4 Ductwork

Ductwork shall be as specified in Section 15895 AIR SUPPLY, DISTRIBUTION, VENTILATION, AND EXHAUST SYSTEM except that a flexible connection shall be used to connect the duct to the remote radiator. Material for the connection shall be wire-reinforced glass. The connection shall be rendered as airtight as possible.

## 2.5.5 Temperature Sensors

Each engine shall be equipped with coolant temperature sensors. Temperature sensors shall provide signals for pre-high and high indication and alarms.

## 2.6 SOUND LIMITATIONS

\*1

The noise generated by the diesel generator set operating at 100 percent load shall not exceed the following sound pressure levels in any of the indicated frequencies when measured in a free field at a radial distance of 22.9 feet 7 meters at 45 degrees apart in all directions.

Frequency Band (Hz)	Maximum Acceptable Pressure Level (Decibels)
31	>83_
63	84
125	83
250	84
500	85
1,000	86
2,000	86
4,000	79
8,000	69

\*1

## 2.7 AIR INTAKE EQUIPMENT

Filters and silencers shall be provided in locations that are convenient for servicing. The silencer shall be of the high-frequency filter type, located in the air intake system as recommended by the engine manufacturer.

Silencer shall be capable of reducing the noise level at the air intake so that the indicated pressure levels specified in paragraph SOUND LIMITATIONS will not be exceeded. A combined filter-silencer unit meeting requirements for the separate filter and silencer items may be provided. Expansion elements in air-intake lines shall be copper or rubber.

## 2.8 EXHAUST SYSTEM

Piping shall be supported to minimize vibration. Where a V-type engine is provided, a V-type connector, with necessary flexible sections and hardware, shall connect the engine exhaust outlets.

## 2.8.1 Flexible Sections and Expansion Joints



A flexible section shall be provided at each engine and an expansion joint at each muffler. Flexible sections and expansion joints shall have flanged connections. Flexible sections shall be made of convoluted seamless tube without joints or packing. Expansion joints shall be the bellows type. Expansion and flexible elements shall be stainless steel suitable for diesel-engine exhaust gas at the maximum exhaust temperature that is specified by the engine manufacturer. Expansion and flexible elements shall be capable of absorbing vibration from the engine and compensation for thermal expansion and contraction.

#### 2.8.2 Exhaust Muffler

A chamber type exhaust muffler shall be provided. The muffler shall be constructed of welded steel and designed for inside mounting. Eyebolts, lugs, flanges, or other items shall be provided as necessary for support in the location and position indicated. Pressure drop through the muffler shall not exceed the recommendations of the engine manufacturer. Outside mufflers shall be zinc coated or painted with high temperature 1000 degrees F. resisting paint. The muffler and exhaust piping together shall reduce the noise level to less than the maximum acceptable level listed for sound limitations in paragraph SOUND LIMITATIONS. The muffler shall have a drain valve, nipple, and cap at the low-point of the muffler.

#### 2.8.3 Exhaust Piping

Horizontal sections of exhaust piping shall be sloped downward away from the engine to a drip leg for collection of condensate with drain valve and cap. Changes in direction shall be long radius. Exhaust piping, mufflers and silencers installed inside any building shall be insulated in accordance with paragraph THERMAL INSULATION and covered to protect personnel. Vertical exhaust piping shall be provided with a hinged, gravity-operated, self-closing, rain cover.

\*1

#### 2.9 NOT USED

#### 2.10 NOT USED

\*1

#### 2.11 STARTING SYSTEM

The starting system for standby engine generator sets used in emergency applications shall be in accordance with NFPA 99 and NFPA 110 and as follows.

##### 2.11.1 Controls

An engine control switch shall be provided with functions including: run/start(manual), off/reset, and, automatic mode. Start-stop logic shall be provided for adjustable cycle cranking and cooldown operation. The logic shall be arranged for manual starting. Electrical starting systems shall be provided with an adjustable cranking limit device to limit cranking periods from 1 second up to the maximum duration.

##### 2.11.2 Capacity

The starting system shall be of sufficient capacity, at the maximum indoor summer temperature specified to crank the engine without damage or overheating. The system shall be capable of providing a minimum of three cranking periods with 15 second intervals between cranks. Each cranking period shall have a maximum duration of 15 seconds.

#### 2.11.3 Electrical Starting

Manufacturers recommended dc system, utilizing a negative circuit ground.

##### 2.11.3.1 Battery

A starting battery system shall be provided and shall include the battery, battery rack, intercell connectors, spacers, automatic battery charger with overcurrent protection, metering and relaying. The battery shall be in accordance with SAE J 537. Critical system components (rack, protection, etc.) shall be sized to withstand the seismic acceleration forces specified.

The battery shall be nickel-cadmium, with sufficient capacity, at the minimum indoor and maximum indoor temperature specified, to provide the specified cranking periods. Valve-regulated lead-acid batteries are not acceptable.

##### 2.11.3.2 Battery Charger

A current-limiting battery charger, conforming to UL 1236, shall be provided and shall automatically recharge the batteries. The charger shall be capable of an equalize-charging rate for recharging fully depleted batteries within 8 hours and a floating charge rate for maintaining the batteries at fully charged condition. An ammeter shall be provided to indicate charging rate. A voltmeter shall be provided to indicate charging voltage. A timer shall be provided for the equalize-charging-rate setting.

A battery is considered to be fully depleted when the output voltage falls to a value which will not operate the engine generator set and its components.

#### 2.11.4 Starting Aids

The manufacturer shall provide one or more of other following methods to assist engine starting.

**\*1**

##### 2.11.4.1 NOT USED

**\*1**

##### 2.11.4.2 Jacket-Coolant Heaters

A thermostatically controlled electric heater shall be mounted in the engine coolant jacketing to automatically maintain the coolant within plus or minus 3 degrees F of the control temperature. The heater shall operate independently of engine operation so that starting times are minimized. Power for the heaters shall be 120 volts ac. The control temperature shall be the temperature recommended by the engine manufacturer to meet the starting time specified at the minimum winter outdoor temperature.

#### 2.11.5 Exerciser

The exerciser shall be in accordance with Section 16410, AUTOMATIC TRANSFER AND BY-PASS/ISOLATION SWITCHES.

## 2.12 GOVERNOR

Each engine shall be provided with a governor which maintains the frequency within a bandwidth of the rated frequency, over a steady-state load range of zero to 100% of rated output capacity. The governor shall be configured for safe manual adjustment of the speed/frequency during operation of the engine-generator set, without special tools, from 90 to 110% of the rated speed/frequency, over a steady state load range of 0 to 100% or rated capacity.

### 2.12.1 Governor Performance

Isochronous governors shall maintain the midpoint of the frequency bandwidth at the same value for steady-state loads over the range of zero to 100% of rated output capacity.

## 2.13 GENERATOR

Each generator shall be of the synchronous type, one or two bearing, conforming to NEMA MG 1, equipped with winding terminal housings in accordance with NEMA MG 1, equipped with an amortisseur winding, and directly connected to the engine. Insulation shall be Class H. Generator design shall protect against mechanical, electrical and thermal damage due to vibration, 25% overspeeds, or voltages and temperatures at a rated output capacity 100% for standby applications. Generator ancillary equipment shall meet the short circuit requirements of NEMA MG 1. Frames shall be the drip-proof type.

### 2.13.1 Current Balance

At 100% rated output capacity, and load impedance equal for each of the 3 phases, the permissible current difference between any 2 phases shall not exceed 2% of the largest current on either of the 2 phases.

### 2.13.2 Voltage Balance

At any balanced load between 75 and 100% of rated output capacity, the difference in line-to-neutral voltage among the 3 phases shall not exceed 1% of the average line-to-neutral voltage. For a single-phase load condition, consisting of 25% load at unity power factor placed between any phase and neutral with no load on the other 2 phases, the maximum simultaneous difference in line-to-neutral voltage between the phases shall not exceed 3% of rated line to neutral voltage. The single-phase load requirement shall be valid utilizing normal exciter and regulator control. The interpretation of the 25% load for single phase load conditions means 25% of rated current at rated phase voltage and unity power factor.

### 2.13.3 Waveform

The deviation factor of the line-to-line voltage at zero load and at

balanced rated output capacity shall not exceed 10%. The RMS of all harmonics shall be less than 5.0% and that of any one harmonic less than 3.0% of the fundamental at rated output capacity. Each engine-generator shall be designed and configured to meet the total harmonic distortion limits of IEEE Std 519.

#### 2.14 EXCITER

The generator exciter shall be of the brushless type. Semiconductor rectifiers shall have a minimum safety factor of 300% for peak inverse voltage and forward current ratings for all operating conditions, including 110% generator output at 104 degrees F ambient. The exciter and regulator in combination shall maintain generator-output voltage within the limits specified.

#### 2.15 VOLTAGE REGULATOR

Each generator shall be provided with a solid-state voltage regulator, separate from the exciter. The regulator shall maintain the voltage within a bandwidth of the rated voltage, over a steady-state load range of zero to 100% of rated output capacity. Regulator shall be configured for safe manual adjustment of the engine-generator voltage output without special tools, during operation, from 90 to 110% of the rated voltage over the steady state load range of 0 to 100% of rated output capacity. Regulation drift shall not exceed plus or minus 0.5% for an ambient temperature change of 68 degrees F.

##### 2.15.1 Steady State Performance (Regulation or Voltage Droop)

The voltage regulator shall have a maximum droop of 2% of rated voltage over a load range from 0 to 100% of rated output capacity and automatically maintain the generator output voltage within the specified operational bandwidth.

#### 2.16 GENERATOR ISOLATION AND PROTECTION

Devices necessary for electrical protection and isolation of each engine-generator set and its ancillary equipment shall be provided. The generator circuit breaker (IEEE Device 52) ratings shall be consistent with the generator rated voltage and frequency, with continuous, short circuit withstand, and interrupting current ratings to match the generator capacity. The generator circuit breaker shall be manually operated. A set of surge capacitors, to be mounted at the generator terminals shall be provided. Monitoring and control devices shall be as specified in paragraph GENERATOR PANEL.

#### 2.17 SAFETY SYSTEM

Devices, wiring, remote panels, local panels, etc. shall be provided and installed as a complete system to automatically activate the appropriate signals and initiate the appropriate actions. The safety system shall be provided with a self-test method to verify its operability. Alarm signals shall have manual acknowledgment and reset devices. The alarm signal systems shall reactivate for new signals after acknowledgment is given to

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

any signal. The systems shall be configured so that loss of any monitoring device shall be dealt with as an alarm on that system element. All alarms shall send a remote signal to the Lock Operator by way of the Control and Instrumentation system specified in Section 16900 to indicate attention is required for the generator and day tank.

## 2.17.1 Audible Signal

The audible alarm signal shall sound at a frequency of 70 Hz at a volume of 75 dB at 10 feet. The sound shall be continuously activated upon alarm and silenced upon acknowledgment. Signal devices shall be located as shown.

## 2.17.2 Visual Signal

The visual alarm signal shall be a panel light. The light shall be normally off, activated to be blinking upon alarm. The light shall change to continuously lit upon acknowledgement. If automatic shutdown occurs, the display shall maintain activated status to indicate the cause of failure and shall not be reset until cause of alarm has been cleared and/or restored to normal condition. Shutdown alarms shall be red; all other alarms shall be amber.

## 2.17.3 Alarms and Action Logic

## 2.17.3.1 Shutdown

Simultaneous activation of the audible signal, activation of the visual signal and remote signal, stopping the engine, and opening the generator main circuit breakers shall be accomplished.

## 2.17.3.2 Problem

Activation of the visual signal shall be accomplished.

## 2.17.4 Local Alarm Panel

A local alarm panel shall be provided with the following shutdown and alarm functions as indicated and including the listed Corps of Engineer requirements mounted either on or adjacent to the engine generator set.

Device/Condition /Function	What/Where/Size	NFPA 99	NFPA 110 Level 1	NFPA 110 Level 2	Corps of Engrs Required
Shutdowns w/Alarms					
High engine temperature	Automatic/jacket/water/cylinder	SD/CP VA	SD/CP VA	SD/CP VA	SD VA
Low lube-oil pressure	Automatic/pressure/level	SD/CP VA	SD/CP VA	SC/CP VA	SD VA
Overspeed Shutdown&	(110 percent ( $\pm$ 2 % of rated speed)	SD/CP VA	SD/CP VA	SD/CP VA	SD VA

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

Device/Condition /Function	What/Where/Size	NFPA 99	NFPA 110 Level 1	NFPA 110 Level 2	Corps of Engrs Required
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## Alarm

Overcrank, Failure to start	Automatic/Failure to start when used	SD/CP VA	SD/CP VA	SD/CP VA	
			SD/CP VA	SD/CP VA	

Air shutdown damper (200-600kW)	When Used		SD/CP VA	SD/CP VA	
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Red emergency stop switch	Manual Switch		SD/CP VA	SD/CP VA	SD VA
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## Alarms

Low Coolant Temperature	jacket water	CP VA	CP VA	CP VA	
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Pre-High Temperature	jacket water/ cylinder	CP VA	CP VA	CP VAO	CP VA
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Pre-Low Lube-oil Pressure		CP VA			CP VA
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High battery Voltage			CP VA	CP VAO	
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Low battery Voltage			CP VA	CP VAO	
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Battery charger AC Failure	AC supply not available		CP VA	CP VAO	
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Control switch not in AUTO			CP VA	CP VAO	
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Low starting Air pressure			CP VA	CP VAO	
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Low starting hydraulic pressure			CP VA	CP VAO	
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SD - Shut Down

CP - On Control Panel

VA - Visual Alarm

AA - Audible Alarm

O - Optional

## 2.17.5 Time-Delay on Alarms

For startup of the engine-generator set, time-delay devices shall be installed bypassing the low lubricating oil pressure alarm during cranking, and the coolant-fluid outlet temperature alarm. The lube-oil time-delay device shall return its alarm to normal status after the engine starts. The coolant time-delay device shall return its alarm to normal status 5 minutes after the engine starts.

## 2.18 ENGINE GENERATOR SET CONTROLS AND INSTRUMENTATION

Devices, wiring, remote panels, local panels, etc. shall be provided and installed as a complete system to automatically activate the appropriate signals and initiate the appropriate actions.

### 2.18.1 Controls

A local control panel shall be provided with controls in accordance with NFPA 110 level 2 and as follows mounted either on or adjacent to the engine generator set.

Device/Condition/ Function	Corps Requirement	NFPA 110 Level 1	NFPA 110 Level 2	MFG Offering
Controls				
Switch: run/start - off/reset - auto	CP			CP/STD
Emergency stop switch & alarm	CP			CP/STD
Lamp test/indicator test	CP	CP VA	CP VA	CP/STD
Common alarm contacts/ fault relay		X	X	CP/O
Panel lighting	CP			CP/STD
Audible alarm & silencing/reset switch	CP			
Voltage adjust for voltage regulator	CP			CP/STD
Pyrometer display w/selector switch	CP			
Remote emergency stop switch		CP VA	CP VA	
Remote fuel shutoff switch				
Remote lube-oil shutoff switch				

### 2.18.2 Engine Generator Set Metering and Status Indication

A local panel shall be provided with devices in accordance with NFPA 110 level 2 and as follows mounted either on or adjacent to the engine generator set.

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

Device/Condition/ Function	Corps Requirement	NFPA 110 Level 1	NFPA 110 Level 2	MFG Offering
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## Genset Status &amp; Metering

Genset supplying load		CP VA	CP VAO	CP VAO
System ready				CP/STD
Engine oil pressure	CP			CP/STD
Engine coolant temperature	CP			CP/STD
Engine RPM (tachometer)	CP			CP/STD
Engine run hours	CP			CP/STD
Pyrometer display w/selector switch	CP			
AC volts (generator), 3-phase	CP			CP/STD
AC amps (generator), 3 - phase	CP			CP/STD
Generator Frequency	CP			CP/STD
Phase selector switches (amps & volts)	CP			CP/STD
Watts/kW				CP/VA-O
Voltage Regulator Adjustment	CP			

X - Required

CP - On Control Panel

VA - Visual Alarm

AA - Audible Alarm

STD- Manufacturers Standard Offering

O - Optional

## 2.19 PANELS

Each panel shall be of the type and kind necessary to provide specified functions. Panels shall be mounted on the engine-generator set base by vibration/shock absorbing type mountings. Instruments shall be mounted flush or semiflush. Convenient access to the back of panels shall be provided to facilitate maintenance. Instruments shall be calibrated using recognized industry calibration standards. Each panel shall be provided with a panel identification plate which clearly identifies the panel function. Each instrument and device on the panel shall be provided with a plate which clearly identifies the device and its function as indicated. Switch plates shall clearly identify the switch-position function.

## 2.19.1 Enclosures

Enclosures shall be designed for the application and environment, conforming to NEMA ICS 6. Locking mechanisms are optional.



## 2.19.2 Analog

Analog electrical indicating instruments shall be in accordance with ANSI C39.1 with semiflush mounting. Switchboard, switchgear, and control-room panel-mounted instruments shall have 250 degree scales with an accuracy of not less than 99%. Unit-mounted instruments shall be the manufacturer's standard with an accuracy of not less than 98%. The instrument's operating temperature range shall be minus 4 to plus 158 degrees F. Distorted generator output voltage waveform of a crest factor less than 5 shall not affect metering accuracy for phase voltages, hertz and amps.

## 2.19.3 Parameter Display

Indication or readouts of the tachometer, lubricating-oil pressure, coolant temperature, ac voltmeter, ac ammeter, frequency meter, and safety system parameters shall be provided. A momentary switch shall be specified for other panels.

## 2.20 AUTOMATIC ENGINE-GENERATOR-SET SYSTEM OPERATION

Fully automatic operation shall be provided for the following operations: engine-generator set starting and load transfer upon loss of normal source; retransfer upon restoration of the normal source; sequential starting; and stopping of each engine-generator set after cool-down. Devices shall automatically reset after termination of their function.

## 2.20.1 Automatic Transfer Switch

Automatic transfer switches shall be in accordance with Section 16410 AUTOMATIC TRANSFER AND BY-PASS/ISOLATION SWITCHES.

## 2.20.2 Monitoring and Transfer

Devices shall be provided to monitor voltage and frequency for the normal power source and each engine-generator set, and control transfer from the normal source and retransfer upon restoration of the normal source. Functions, actuation, and time delays shall be as described in Section 16410 AUTOMATIC TRANSFER AND BY-PASS/ISOLATION SWITCHES.

## 2.21 MANUAL ENGINE-GENERATOR-SET SYSTEM OPERATION

Complete facilities shall be provided for manual starting and testing of each set without load, loading and unloading of each set.

## 2.22 BASE

The base shall be constructed of steel. The base shall be designed to rigidly support the engine-generator set, ensure permanent alignment of rotating parts, be arranged to provide easy access to allow changing of lube-oil, and ensure that alignment is maintained during shipping and normal operation. The base shall permit skidding in any direction during installation and shall withstand and mitigate the affects of synchronous vibration of the engine and generator. The base shall be provided with suitable holes for anchor bolts and jacking screws for leveling.

## 2.23 THERMAL INSULATION

Thermal insulation shall be as specified in Section 15080 THERMAL INSULATION FOR MECHANICAL SYSTEMS.

## 2.24 PAINTING AND FINISHING

The engine-generator set shall be cleaned, primed and painted in accordance with the manufacturer's standard color and practice.

## 2.25 FACTORY INSPECTION AND TESTS

The factory tests shall be performed on each engine-generator set. The component manufacturer's production line test is acceptable as noted. Each engine-generator set shall be run not less than 1 hour at rated output capacity prior to inspections. Inspections shall be completed and all necessary repairs made, prior to testing. Engine generator controls and protective devices that are provided by the generator set manufacturer as part of the standard package shall be used for factory tests. The Contracting Officer may provide one or more representatives to witness inspections and tests.

## 2.25.1 Factory Inspection

Inspections shall be performed prior to beginning and after completion of testing of the assembled engine-generator set. Inspectors shall look for leaks, looseness, defects in components, proper assembly, etc. and any item found to be in need of correction shall be noted as a necessary repair. The following checklist shall be used for the inspection:

INSPECTION ITEM	GOOD	BAD	NOTES
1. Drive belts			
2. Governor and adjustments			
3. Engine timing mark			
4. Starting motor			
5. Starting aids			
6. Coolant type and concentration			
7. Radiator drains			
8. Block coolant drains			
9. Coolant fill level			
10. All coolant line connections			
11. All coolant hoses			
12. Combustion air filter			
13. Combustion air silencer			
14. Lube oil type			
15. Lube oil sump drain			
16. Lube-oil filter			
17. Lube-oil-level indicator			
18. Lube-oil-fill level			
19. All lube-oil line connections			
20. All lube-oil lines			
21. Fuel type and amount			

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

22. All fuel-line connections
23. All fuel lines
24. Fuel filter
25. Coupling and shaft alignment
26. Voltage regulators
27. Battery-charger connections
28. All wiring connections
29. Instrumentation
30. Hazards to personnel
31. Base
32. Nameplates
33. Paint
34. Exhaust-heat recovery unit
35. Switchboard
36. Switchgear

## 2.25.2 Factory Tests

On engine-generator set tests where the engine and generator are required to be connected and operated together, the load power factor shall be .8 power factor. Electrical measurements shall be performed in accordance with IEEE Std 120. Definitions of terms are in accordance with IEEE Std 100.

Temperature limits in the rating of electrical equipment and for the evaluation of electrical insulation shall be in accordance with IEEE Std 1.

In the following tests where measurements are to be recorded after stabilization of an engine-generator set parameter (voltage, frequency, current, temperature, etc.), stabilization is considered to have occurred when measurements are maintained within the specified bandwidths or tolerances, for a minimum of four consecutive readings. Tests specifically for the generator may be performed utilizing any prime mover.

- a. Insulation Resistance for Stator and Exciter Test, IEEE Std 115 and IEEE Std 43, to the performance criteria in NEMA MG 1, Part 22. Generator manufacturer's production line test is acceptable.
- b. High Potential Test, per IEEE Std 115 and NEMA MG 1, test voltage in accordance with NEMA MG 1. Generator manufacturer's production line test is acceptable.
- c. Winding Resistance Test, Stator and Exciter, per IEEE Std 115. Generator manufacturer's production line test is acceptable.
- d. Overspeed Vibration Test, per IEEE Std 115 to the performance criteria in NEMA MG 1. The test shall be performed at 110% of rated speed for 5 minutes. The vibration shall be measured at the end bearings (front and back of engine, outboard end of generator) in the horizontal, vertical, and axial directions. Vibration amplitude and speed shall be recorded at one minute intervals.
- e. Phase Balance Voltage Test, to the performance criteria specified in paragraph GENERATOR. This test can be performed with any prime mover. Generator manufacturer's production line test results are acceptable.

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

- (1) Start and operate the generator at no load.
  - (2) Adjust a regulated phase voltage (line-to-neutral) to rated voltage.
  - (3) Read and record the generator frequency, line-to-neutral voltages, and the line-to-line voltages.
  - (4) Apply 75% rated load and record the generator frequency, line-to-neutral voltages, and the line-to-line voltages.
  - (5) Apply rated load and record the generator frequency, line-to-neutral voltages, and the line-to-line voltages.
  - (6) Calculate average line-neutral voltage and percent deviation of individual line-neutral voltages from average for each load condition.
- f. Current Balance on Stator Winding Test, by measuring the current on each phase of the winding with the generator operating at 100 % of Rated Output Capacity, with the load impedance equal for each of the three phases: to the performance criteria specified in paragraph GENERATOR.
- g. Voltage Waveform Deviation and Distortion Test per IEEE Std 115 to the performance criteria specified in paragraph GENERATOR. High-speed recording instruments capable of recording voltage waveform deviation and all distortion, including harmonic distortion shall be used. Representation of results shall include appropriate scales to provide a means to measure and interpret results.
- h. Voltage and Frequency Droop Test. Verify that the output voltage and frequency are within the specified parameters as follows:
- (1.) With the generator operating at no load, adjust voltage and frequency to rated voltage and frequency. Record the generator output frequency and line-line and line-neutral voltages.
  - (2.) Increase load to Rated Output Capacity. Record the generator output frequency and line-line and line-neutral voltages.
3. Calculate the percent droop for voltage and frequency with the following equations:

$$\text{Voltage droop \%} = \frac{(\text{No-Load Volts}) - (\text{Rated Capacity volts})}{(\text{Service-Load Volts})} \times 100$$

$$\text{Frequency droop \%} = \frac{(\text{No-Load Hertz}) - (\text{Rated Capacity hertz})}{(\text{Service-Load hertz})} \times 100$$

4. Repeat steps 1 through 3 two additional times without making

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

any adjustments.

- i. Frequency and Voltage Stability and Transient Response. Verify that the engine-generator set responds to addition and dropping of blocks of load in accordance with the transient response requirements. Document maximum voltage and frequency variation from bandwidth and verify that voltage and frequency return to and stabilize within the specified bandwidth, within the specified response time period. Document results in tabular form and with high resolution, high speed strip chart recorders or comparable digital recorders, as approved by the Contracting Officer. Tabular data shall include the following:

Ambient temperature (at 15 minute intervals).

Generator output current (before and after load changes).

Generator output voltage (before and after load changes).

Frequency (before and after load changes).

Generator output power (before and after load changes).

Graphic representations shall include the actual instrument trace of voltage and frequency showing: charts marked at start of test; observed steady-state band; mean of observed band; momentary overshoot and undershoot (generator terminal voltage and frequency) and recovery time for each load change together with the voltage and frequency maximum and minimum trace excursions for each steady state load condition prior to and immediately following each load change. Generator terminal voltage and frequency transient recovery time for each step load increase and decrease.

(1.) Perform and record engine manufacturer's recommended prestarting checks and inspections.

(2.) Start the engine, make and record engine manufacturer's after-starting checks and inspections during a reasonable warm-up period and no load. Verify stabilization of voltage and frequency within specified bandwidths.

(3.) With the unit at no load, apply the Maximum Step Load Increase.

(4.) Apply load in steps equal to the Maximum Step Load Increase until the addition of one more step increase will exceed the Service Load.

(5.) Decrease load to the unit such that addition of the Maximum Step Load Increase will load the unit to 100% of Service Load.

(6.) Apply the Maximum Step Load Increase.

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

- (7.) Decrease load to zero percent in steps equal to the Maximum Step Load Decrease.
- (8.) Repeat steps 3. through 7.
- j. Test Voltage Unbalance with Unbalanced Load (Line-to-Neutral) to the performance criteria specified in paragraph GENERATOR. Prototype test data is acceptable in lieu of the actual test. This test may be performed using any prime mover.
- (1.) Start and operate the generator set at rated voltage, no load, rated frequency, and under control of the voltage regulator. Read and record the generator frequency, line-to-neutral voltages, and the line-to-line voltages.
- (2.) Apply the specified load between terminals  $L_1-L_2$ ,  $L_2-L_0$ , and  $L_3-L_0$  in turn. Record all instrument readings at each line-neutral condition.
- (3.) Express the greatest difference between any two of the line-to-line voltages and any two of the line-to-neutral voltages as a percent of rated voltage.
- (4.) Compare the largest differences expressed in percent with the maximum allowable difference specified.

## PART 3 EXECUTION

## 3.1 GENERAL INSTALLATION

Installation shall provide clear space for operation and maintenance in accordance with NFPA 70 and IEEE C2. Installation of pipe, duct, conduit, and ancillary equipment shall be configured to facilitate easy removal and replacement of major components and parts of the engine-generator set.

## 3.2 PIPING INSTALLATION

Fuel piping external to the engine generator set shall be installed in accordance with section 13202 FUEL STORAGE SYSTEM. Piping shall be welded.

Connections at valves shall be flanged. Connections at equipment shall be flanged except that connections to the diesel engine may be threaded if the diesel-engine manufacturers standard connection is threaded. Except where otherwise specified, welded flanged fittings shall be utilized to allow for complete dismantling and removal of each piping system from the facility without disconnecting or removing any portion of any other system's equipment or piping. Connections to equipment shall be made with vibration-isolation-type flexible connectors. Piping and tubing shall be supported and aligned to prevent stressing of flexible hoses and connectors. Pipes extending through the roof shall be properly flashed. Piping shall be installed clear of windows, doors and openings, to permit thermal expansion and contraction without damage to joints or hangers, and shall be installed with a 1/2 inch drain valve with cap at each low point.

## 3.2.1 Support

Hangers, inserts, and supports shall be of sufficient size to accommodate any insulation and shall conform to MSS SP-58 and MSS SP-69. Supports shall be spaced not more than 7 feet on center for pipes 2 inches in diameter or less, not more than 12 feet on center for pipes larger than 2 inches but smaller than 4 inches in diameter, and not more than 17 feet on center for pipes larger than 4 inches in diameter. Supports shall be provided at pipe bends or change of direction.

#### 3.2.1.1 Ceiling and Roof

Exhaust piping shall be supported with appropriately sized Type 41 single pipe roll and threaded rods; all other piping shall be supported with appropriately sized Type 1 clevis and threaded rods.

#### 3.2.1.2 Wall

Wall supports for pipe shall be made by suspending the pipe from appropriately sized Type 33 brackets with the appropriate ceiling and roof pipe supports.

#### 3.2.2 Flanged Joints

Flanges shall be Class 125 type, drilled, and of the proper size and configuration to match the equipment and diesel engine connections. Flanged joints shall be gasketed and made up square and tight.

#### 3.2.3 Cleaning

After fabrication and before assembly, piping interiors shall be manually wiped clean of debris.

#### 3.2.4 Pipe Sleeves

Pipes passing through construction such as ceilings, floors, or walls shall be fitted with sleeves. Each sleeve shall extend through and be securely fastened in its respective structure and shall be cut flush with each surface. The structure shall be built tightly to the sleeve. The inside diameter of each sleeve shall be minimum 1/2 inch, and where pipes pass through combustible materials 1 inch larger than the outside diameter of the passing pipe or pipe insulation/covering.

### 3.3 ELECTRICAL INSTALLATION

Electrical installation shall comply with NFPA 70, IEEE C2, and Section 16415 ELECTRICAL WORK, INTERIOR.

#### 3.3.1 Vibration Isolation

Flexible fittings shall be provided for conduit, cable trays, and raceways attached to engine-generator sets. Metallic conductor cables installed on the engine generator set and from the engine generator set to equipment not mounted on the engine generator set shall be flexible stranded conductor. Terminations of conductors on the engine generator set shall be crimp-type

terminals or lugs.

### 3.4 FIELD PAINTING

Field painting shall be as specified in Section 09900 PAINTING, GENERAL.

### 3.5 ONSITE INSPECTION AND TESTS

#### 3.5.1 Test Conditions

##### 3.5.1.1 Data

Measurements shall be made and recorded of all parameters necessary to verify that each set meets specified parameters. If the results of any test step are not satisfactory, adjustments, replacements, or repairs shall be made and the step repeated until satisfactory results are obtained. Unless otherwise indicated, data shall be recorded in 15 minute intervals during engine-generator set operation and shall include: readings of all engine-generator set meters and gauges for electrical and power parameters; oil pressure; ambient temperature; and engine temperatures available from meters and gauges supplied as permanent equipment on the engine-generator set. Electrical measurements shall be performed in accordance with IEEE Std 120. Definitions of terms are in accordance with IEEE Std 100. Temperature limits in the rating of electrical equipment and for the evaluation of electrical insulations shall be in accordance with IEEE Std 1.

##### 3.5.1.2 Power Factor

\*1

For all engine-generator set operating tests the load power factor shall be 1.0 power factor.

\*1

##### 3.5.1.3 Contractor Supplied Items

The Contractor shall provide equipment and supplies required for inspections and tests including fuel, test instruments, and loadbanks at the specified power factors.

##### 3.5.1.4 Instruments

Readings of panel gauges, meters, displays, and instruments provided as permanent equipment shall be verified during test runs, using test instruments of greater precision and accuracy. Test instrument accuracy shall be within the following: current plus or minus 1.5%, voltage plus or minus 1.5%, real power plus or minus 1.5%, reactive power plus or minus 1.5%, power factor plus or minus 3%, frequency plus or minus 0.5%. Test instruments shall be calibrated by a recognized standards laboratory within 30 days prior to testing.

##### 3.5.1.5 Sequence

The sequence of testing shall be as specified in the approved testing plan unless variance is authorized by the Contracting Officer. Field testing shall be performed in the presence of the Contracting Officer. Tests may be scheduled and sequenced in order to optimize run-time periods; however,



## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

the following general order of testing shall be followed: Construction Tests; Inspections; Pre-operational Tests; Safety Run Tests; Performance Tests; and Final Inspection.

### 3.5.2 Construction Tests

Individual component and equipment functional tests for fuel piping, coolant piping, and lubricating-oil piping, electrical circuit continuity, insulation resistance, circuit protective devices, and equipment not provided by the engine-generator set manufacturer shall be performed prior to connection to the engine-generator set.

#### 3.5.2.1 Piping Test

- a. Lube-oil and fuel-oil piping shall be flushed with the same type of fluid intended to flow through the piping, until the outflowing fluid has no obvious sediment or emulsion.
- b. Fuel piping which is external to the engine-generator set shall be tested in accordance with NFPA 30 and Section 13202 FUEL STORAGE SYSTEMS. All remaining piping which is external to the engine-generator set shall be pressure tested with air pressure at 150% of the maximum anticipated working pressure, but not less than 150 psi, for a period of 2 hours to prove the piping has no leaks. If piping is to be insulated, the test shall be performed before the insulation is applied.

#### 3.5.2.2 Electrical Equipment Tests

- a. Low-voltage cable insulation integrity tests shall be performed for cables connecting the generator breaker to the automatic transfer switch. Low-voltage cable, complete with splices, shall be tested for insulation resistance after the cables are installed, in their final configuration, ready for connection to the equipment, and prior to energization. The test voltage shall be 500 volts dc, applied for one minute between each conductor and ground and between all possible combinations conductors in the same trench, duct, or cable, with all other conductors in the same trench, duct, or conduit. The minimum value of insulation shall be:

$R \text{ in megohms} = (\text{rated voltage in kV} + 1) \times 304,800 / (\text{length of cable in meters})$

$R \text{ in megohms} = (\text{rated voltage in kV} + 1) \times 1000 / (\text{length of cable in feet})$

Each cable failing this test shall be repaired or replaced. The repair cable shall be retested until failures have been eliminated.

- b. Not Used
- c. Ground-Resistance Tests. The resistance of each grounding electrode shall be measured using the fall-of-potential method

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

defined in IEEE Std 81. Ground resistance measurements shall be made before the electrical distribution system is energized and shall be made in normally dry conditions not less than 48 hours after the last rainfall. Resistance measurements of separate grounding electrode systems shall be made before the systems are bonded together below grade. The combined resistance of separate systems may be used to meet the requirements resistance, but the specified number of electrodes must still be provided as follows:

- (1.) Single rod electrode - 25 ohms.
- (2.) Multiple rod electrodes - 25 ohms.
- (3.) Ground mat - 25 ohms.

- d. Circuit breakers and switchgear shall be examined and tested in accordance with the manufacturer's published instructions for functional testing.

### 3.5.3 Inspections

The following inspections shall be performed jointly by the Contracting Officer and the Contractor, after complete installation of each engine-generator set and its associated equipment, and prior to startup of the engine-generator set. Checks applicable to the installation shall be performed. The results of those which are physical inspections (I) shall be documented by the Contractor and submitted in accordance with paragraph SUBMITTALS. The Contractor shall present manufacturer's data for the inspections designated (D) at the time of inspection. Inspections shall verify that equipment type, features, accessibility, installation and condition are in accordance with the contract specification. Manufacturer's statements shall certify provision of features which cannot be verified visually.

- 1. Drive belts. (I)
- 2. Governor type and features. (I)
- 3. Engine timing mark. (I)
- 4. Starting motor. (I)
- 5. Starting aids. (I)
- 6. Coolant type and concentration. (D)
- 7. Radiator drains. (I)
- 8. Block coolant drains. (I)
- 9. Coolant fill level. (I)
- 10. Coolant line connections. (I)
- 11. Coolant hoses. (I)
- 12. Combustion air filter. (I)
- 13. Intake air silencer. (I)
- 14. Lube oil type. (D)
- 15. Lube oil sump drain. (I)
- 16. Lube-oil filter. (I)
- 17. Lube-oil level indicator. (I)
- 18. Lube-oil fill level. (I)
- 19. Lube-oil line connections. (I)
- 20. Lube-oil lines. (I)

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

- 21. Fuel type. (D)
- 22. Fuel-level. (I)
- 23. Fuel-line connections. (I)
- 24. Fuel lines. (I)
- 25. Fuel filter. (I)
- 26. Access for maintenance. (I)
- 27. Voltage regulator. (I)
- 28. Battery-charger connections. (I)
- 29. Wiring & terminations. (I)
- 30. Instrumentation. (I)
- 31. Hazards to personnel. (I)
- 32. Base. (I)
- 33. Nameplates. (I)
- 34. Paint. (I)
- 35. Exhaust-heat system. (I)
- 36. Exhaust muffler. (I)
- 37. Switchboard. (I)
- 38. Switchgear. (I)
- 39. Access provided to controls. (I)
- 40. Enclosure is weather resistant. (I)
- 41. Engine & generator mounting bolts (application). (I)

## 3.5.4 Pre-operational Tests

## 3.5.4.1 Protective Relays

Protective relays shall be visually and mechanically inspected, adjusted, tested, and calibrated in accordance with the manufacturer's published instructions. Tests shall include pick-up, timing, contact action, restraint, and other aspects necessary to ensure proper calibration and operation. Relay settings shall be implemented in accordance with the installation coordination study. Relay contacts shall be manually or electrically operated to verify that the proper breakers and alarms initiate. Relaying current transformers shall be field tested in accordance with IEEE ANSI/IEEE C57.13.1.

## 3.5.4.2 Insulation Test

Generator and exciter circuits insulation resistance shall be tested in accordance with IEEE Std 43. Stator readings shall be taken at the circuit breaker, to include generator leads to automatic transfer switch. Results of insulation resistance tests shall be recorded. Readings shall be within limits specified by the manufacturer. Mechanical operation, insulation resistance, protective relay calibration and operation, and wiring continuity of automatic transfer switch assembly shall be verified. Precautions shall be taken to preclude damaging generator components during test.

## 3.5.4.3 Engine-Generator Connection Coupling Test

When the generator provided is a two-bearing machine, the engine-generator connection coupling shall be inspected and checked by dial indicator to prove that no misalignment has occurred. The dial indicator shall measure variation in radial positioning and axial clearance between the coupling

halves. Readings shall be taken at four points, spaced 90 degrees apart. Solid couplings and pin-type flexible couplings shall be aligned within a total indicator reading of 0.0005 to 0.001 inch for both parallel and angular misalignment. For gear-type or grid-type couplings, 0.002 inch will be acceptable.

#### 3.5.5 Safety Run Test

For the following tests, if any parts are changed, or adjustments made to the generator set, its controls, or auxiliaries, the associated safety tests shall be repeated.

- a. Perform and record engine manufacturer's recommended prestarting checks and inspections.
- b. Start the engine, record the starting time, make and record engine manufacturer's after-starting checks and inspections during a reasonable warm-up period.
- c. Activate the manual emergency stop switch and verify that the engine stops.
- d. Remove the high and pre-high lubricating oil temperature sensing elements from the engine and temporarily install a temperature gauge in their normal locations on the engine (required for safety, not for recorded data). Where necessary provide temporary wiring harness to connect the sensing elements to their permanent electrical leads.
- e. Start the engine, record the starting time, make and record engine manufacturer's after-starting checks and inspections during a reasonable warm-up period. Operate the engine-generator set at no load until the output voltage and frequency stabilize. Monitor the temporarily installed temperature gauges. If either temperature reading exceeds the value required for an alarm condition, activate the manual emergency stop switch.
- f. Immerse the elements in a vessel containing controlled-temperature hot oil and record the temperature at which the pre-high alarm activates and the temperature at which the engine shuts down. Remove the temporary temperature gauges and reinstall the temperature sensors on the engine.
- g. Remove the high and pre-high coolant temperature sensing elements from the engine and temporarily install a temperature gauge in their normal locations on the engine (required for safety, not for recorded data). Where necessary provide temporary wiring harness to connect the sensing elements to their permanent electrical leads.
- h. Start the engine, record the starting time, make and record engine manufacturer's after-starting checks and inspections during a reasonable warm-up period. Operate the engine generator-set at no load until the output voltage and frequency stabilize.

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

- i. Immerse the elements in a vessel containing controlled-temperature hot oil and record the temperature at which the pre-high alarm activates and the temperature at which the engine shuts down. Remove the temporary temperature gauges and reinstall the temperature sensors on the engine.
- j. Start the engine, record the starting time, make and record engine manufacturer's after-starting checks and inspections during a reasonable warm-up period.
- k. Operate the engine generator-set for at least 2 hours at 75% of Service Load.
- l. Verify proper operation and setpoints of gauges and instruments.
- m. Verify proper operation of ancillary equipment.
- n. Manually adjust the governor to increase engine speed past the overspeed limit. Record the RPM at which the engine shuts down.
- o. Start the engine, record the starting time, make and record engine manufacturer's after-starting checks and inspections and operate the engine generator-set for at least 15 minutes at 75% of Service Load.
- p. Manually adjust the governor to increase engine speed to within 2% of the overspeed trip speed previously determined and operate at that point for 5 minutes. Manually adjust the governor to the rated frequency.
- q. Manually fill the day tank to a level above the overfill limit. Record the level at which the overfill alarm sounds. Verify shutdown of the fuel transfer pump. Drain the day tank down below the overfill limit.
- r. Shut down the engine. Remove the time-delay low lube oil pressure alarm bypass and try to start the engine.
- s. Attach a manifold to the engine oil system (at the oil pressure sensor port) that contains a shutoff valve in series with a connection for the engine's oil pressure sensor followed by an oil pressure gauge ending with a bleed valve. The engine's oil pressure sensor shall be moved from the engine to the manifold. The manifold shutoff valve shall be open and bleed valve closed.
- t. Start the engine, record the starting time, make and record engine manufacturer's after-starting checks and inspections and operate the engine generator-set for at least 15 minutes at 75% of Service Load.
- u. Close the manifold shutoff valve. Slowly allow the pressure in the manifold to bleed off through the bleed valve while watching the pressure gauge. Record the pressure at which the engine shuts

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

down. Catch oil spillage from the bleed valve in a container. Add the oil from the container back to the engine, remove the manifold, and reinstall the engine's oil pressure sensor on the engine.

- v. Start the engine, record the starting time, make and record engine manufacturer's after-starting checks and inspections and operate the engine generator-set for at least 15 minutes at 100% of Service Load. Record the maximum sound level in each frequency band at a distance of 75 feet from the end of the exhaust and air intake piping directly along the path of intake and discharge for horizontal piping; or at a radius of 75 feet from the engine at 45 degrees apart in all directions for vertical piping. The muffler and air intake silencer shall be modified or replaced as required to meet the sound limitations of this specification. If the sound limitations can not be obtained by modifying or replacing the muffler and air intake silencer, the contractor shall notify the Contracting Officers Representative and provide a recommendation for meeting the sound limitations.
- w. Manually drain off fuel slowly from the day tank to empty it to below the low fuel level limit and record the level at which the audible alarm sounds. Add fuel back to the day tank to fill it above low level alarm limits.

### 3.5.6 Performance Tests

In the following tests, where measurements are to be recorded after stabilization of an engine-generator set parameter (voltage, frequency, current, temperature, etc.), stabilization is considered to have occurred when measurements are maintained within the specified bandwidths or tolerances, for a minimum of four consecutive readings. For the following tests, if any parts are changed, or adjustments made to the generator set, its controls, or auxiliaries, the associated tests shall be repeated.

#### 3.5.6.1 Continuous Engine Load Run Test

Test the engine-generator set and ancillary systems at service load to demonstrate durability; verify that heat of extended operation does not adversely affect or cause failure in any part of the system; and check all parts of the system. If the engine load run test is interrupted for any reason, the entire test shall be repeated. The engine load run test shall be accomplished principally during daylight hours, during warm weather months, May through August. After each change in load in the following test, measure the vibration at the end bearings (front and back of engine, outboard end of generator) in the horizontal, vertical, and axial directions. Verify that the vibration is within the allowable range. Data taken at 15 minute intervals shall include the following:

Electrical: Output amperes, voltage, real and reactive power, power factor, frequency.

Pressure: Lube-oil.

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

Temperature: Coolant.  
 Lube-oil.  
 Exhaust.  
 Ambient.

- a. Perform and record engine manufacturer's recommended prestarting checks and inspections. Include as a minimum checking of coolant fluid, fuel, and lube-oil levels.
- b. Start the engine, make and record engine manufacturer's after-starting checks and inspections during a reasonable warmup period.
- c. Operate the engine generator-set for 2 hours at 75% of Service Load.
- d. Increase load to 100% of Service Load and operate the engine generator-set for 4 hours.
- e. Not Used
- f. Decrease load to 100% of Service Load and operate the engine generator-set for 2 hours or until all temperatures have stabilized.
- g. Remove load from the engine-generator set.

## 3.5.6.2 Voltage and Frequency Droop Test

For the following steps, verify that the output voltage and frequency return to and stabilize within the specified bandwidth values following each load change. Record the generator output frequency and line-line and line-neutral voltages following each load change.

- a. With the generator operating at no load, adjust voltage and frequency to rated voltage and frequency.
- b. Increase load to 100% of Rated Output Capacity. Record the generator output frequency and line-line and line-neutral voltages.
- c. Calculate the percent droop for voltage and frequency with the following equations.

$$\text{Voltage droop \%} = \frac{\text{No-load volts} - \text{rated output capacity volts}}{\text{Rated output capacity volts}} \times 100$$

$$\text{Frequency droop \%} = \frac{\text{No load hertz} - \text{rated output capacity hertz}}{\text{Rated output capacity volts}} \times 100$$

- d. Repeat steps a. through c. two additional times without making any

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

adjustments.

## 3.5.6.3 Voltage Regulator Range Test

- a. While operating at no load, verify that the voltage regulator adjusts from 90% to 110% of rated voltage.
- b. Increase load to 100% of Rated Output Capacity. Verify that the voltage regulator adjusts from 90% to 110% of rated voltage.

## 3.5.6.4 Governor Adjustment Range Test

- a. While operating at no load, verify that the governor adjusts from 90% to 110% of rated frequency.
- b. Increase load to 100% of Rated Output Capacity. Verify that the governor adjusts from 90% to 110% of rated frequency.

## 3.5.6.5 Frequency and Voltage Stability and Transient Response

Verify that the engine-generator set responds to addition and dropping of blocks of load in accordance with the transient response requirements. Document maximum voltage and frequency variation from bandwidth and verify that voltage and frequency return to and stabilize within the specified bandwidth, within the specified response time period. Document results in tabular form and with high resolution, high speed strip chart recorders or comparable digital recorders, as approved by the Contracting Officer. Tabular data shall include the following:

- (1.) Ambient temperature (at 15 minute intervals).
- (2.) Generator output current (before and after load changes).
- (3.) Generator output voltage (before and after load changes).
- (4.) Frequency (before and after load changes).
- (5.) Generator output power (before and after load changes).
- (6.) Graphic representations shall include the actual instrument trace of voltage and frequency showing:

Charts marked at start of test; observed steady-state band; mean of observed band; momentary overshoot and undershoot (generator terminal voltage and frequency) and recovery time for each load change together with the voltage and frequency maximum and minimum trace excursions for each steady state load condition prior to and immediately following each load change. Generator terminal voltage and frequency transient recovery time for each step load increase and decrease.

- a. Perform and record engine manufacturer's recommended prestarting checks and inspections.



## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

- b. Start the engine, make and record engine manufacturer's after-starting checks and inspections during a reasonable warm-up period and no load. Verify stabilization of voltage and frequency within specified bandwidths.
- c. With the unit at no load, apply the Maximum Step Load Increase.
- d. Apply load in steps equal to the Maximum Step Load Increase until the addition of one more step increase will exceed the Service Load.
- e. Decrease load to the unit such that addition of the Maximum Step Load Increase will load the unit to 100% of Service Load.
- f. Apply the Maximum Step Load Increase.
- g. Decrease load to zero percent in steps equal to the Maximum Step Load Decrease.
- h. Repeat steps c. through g.

## 3.5.7 Parallel Operation Test (Commercial Source)

Connect each set parallel with the commercial power source. Operate in parallel for 15 minutes. Verify stabilization of voltage and frequency within specified bandwidths. Record the output voltage, frequency, and loading to demonstrate ability to synchronize with the commercial power source.

## 3.5.8 Final Testing and Inspection

- a. Start the engine, record the starting time, make and record all engine manufacturer's after-starting checks and inspections during a reasonable warm-up period.
- b. Increase the load in steps no greater than the Maximum Step Load Increase to 100% of Service Load, and operate the engine-generator set for at least 30 minutes. Measure the vibration at the end bearings (front and back of engine, outboard end of generator) in the horizontal, vertical, and axial directions. Verify that the vibration is within the same range as previous measurements and is within the required range.
- c. Remove load and shut down the engine-generator set after the recommended cool down period.
- d. Remove the lube oil filter and have the oil and filter examined by the engine manufacturer for excessive metal, abrasive foreign particles, etc. Any corrective action shall be verified for effectiveness by running the engine for 8 hours at Service Load, then re-examining the oil and filter.
- e. Remove the fuel filter and examine the filter for trash, abrasive foreign particles, etc.

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

- f. Visually inspect and check engine and generator mounting bolts for tightness and visible damage.
- g. Replace air, oil, and fuel filters with new filters.

## 3.6 POSTED DATA AND INSTRUCTIONS

Posted Data and Instructions shall be posted prior to field acceptance testing of the engine generator set. Two sets of instructions/data shall be typed and framed under weatherproof laminated plastic, and posted side-by-side where directed. First set shall include a one-line diagram, wiring and control diagrams and a complete layout of the system. Second set of shall include the condensed operating instructions describing manufacturer's pre-start checklist and precautions; startup procedures for test-mode, manual-start mode, and automatic-start mode (as applicable); running checks, procedures, and precautions; and shutdown procedures, checks, and precautions. Instructions shall include procedures for interrelated equipment (such as heat recovery systems, co-generation, load-shedding, and automatic transfer switches).

## 3.7 ONSITE TRAINING

The Contractor shall conduct training course for operating staff as designated by the Contracting Officer. The training period shall consist of a total 8 hours of normal working time and shall start after the system is functionally completed but prior to final acceptance. All operation and maintenance manuals shall be approved and made available for the training course. All posted instructions shall be approved and posted prior to the beginning date of the training course. The training course schedule shall be coordinated with the Using Service's work schedule, and submitted for approval 14 days prior to beginning date of proposed beginning date of training. The course instructions shall cover pertinent points involved in operating, starting, stopping, servicing the equipment, as well as major elements of the operation and maintenance manuals. Additionally, the course instructions shall demonstrate routine maintenance procedures as described in the operation and maintenance manuals. Two copies of a video tape of the manufacturers operating and maintenance training course shall be submitted.

## 3.8 ACCEPTANCE

Final acceptance of the engine-generator set will not be given until the contractor has successfully completed all tests and all defects in installation material or operation have been corrected.

-- End of Section --

SECTION TABLE OF CONTENTS

DIVISION 16 - ELECTRICAL

SECTION 16800

AUDIO SYSTEM

11/01

PART 1 GENERAL

- 1.1 SCOPE OF WORK
- 1.2 WORK NOT INCLUDED
- 1.3 DEFINITIONS
- 1.4 SUBMITTALS
- 1.5 QUALITY OF MATERIALS AND EQUIPMENT
- 1.6 WARRANTY
- 1.7 POST ACCEPTANCE OF SOFTWARE CHANGES
- 1.8 SYSTEM DESCRIPTION
- 1.9 CODE COMPLIANCE
- 1.10 NOT USED
- 1.10 PAYMENT

PART 2 PRODUCTS

- 2.1 SYSTEM COMPONENTS
- 2.2 EQUIPMENT LIST
- 2.3 CABLING

PART 3 EXECUTION

- 3.1 INSTALLATION
- 3.2 PHYSICAL INSTALLATION
- 3.3 CABLES AND WIRING
- 3.4 PATCH PANELS
- 3.5 GROUNDING
- 3.6 PERFORMANCE STANDARDS
- 3.7 TESTING

-- End of Section Table of Contents --

## SECTION 16800

## AUDIO SYSTEM

11/01

## PART 1 GENERAL

This project will consist of an audio system for the Visitor Overlook and will serve two purposes; a multi-stationed audio playback system for visitor information detailing various aspects of McAlpine Lock and Dam and a public address system to distribute vocal sound reinforcement across the Overlook pedway and canopy areas.

## 1.1 SCOPE OF WORK

A. The Contractor shall do all final engineering and custom design, fabricate, assemble, pretest, install and demonstrate with final tests for acceptance of all Audio Equipment and Systems included in these specifications and drawings.

B. The Contractor shall furnish all equipment and materials, whether specifically mentioned herein or not, to ensure a complete and operating system.

C. The Contractor shall be responsible for supplying software and custom programming services ( if needed ) for the Audio system described in these specifications and associated conceptual system drawing. Contractor is responsible for generating control panel layouts and a button-by-button description of functionality. Owner must approve contractors proposed software functionality and control panel layouts prior to installation of any equipment onsite.

D. Where interfaces, signal converters, distribution amplifiers, level or impedance matching devices are technically required to achieve proper interconnection between equipment the Contractor shall determine these requirements in advance and include them as part of their base bid.

E. The Contractor shall be responsible for the initial adjustment of the systems as prescribed herein and shall provide all test equipment necessary to demonstrate compliance with these specifications.

F. The Contractor shall provide on-the-job training in the operation and maintenance of the system for personnel designated by the Owner. Owner may elect that this training to be conducted on up to four separate days within the first 90 days following substantial completion. The Contractor shall budget 16 hours of dedicated onsite training.

G. The A/V Subcontractor shall provide device backboxes for installation by the Electrical Subcontractor for speakers located in the stone pedestals on the Overlook pedway. A/V Subcontractor shall also coordinate with

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

Electrical Subcontractor the location of the speakers in the stone pedestals.

## 1.2 WORK NOT INCLUDED

Certain equipment and materials will be provided and installed by others. Unless otherwise indicated in these specifications, or in related drawings, these will include the following:

- A. J-boxes, pull boxes, conduits and wireways.
- B. All lighting fixtures, dimmers, power receptacles, and circuit breakers and interconnecting wiring.
- C. All structural work, wall openings, platforms, railings, stairs, fire prevention and safety devices, rough and finished trim, painting and patching, drapes, carpets, floor coverings, glazing, acoustical treatments, and heating, ventilation and air conditioning systems.
- D. All network data outlets, wiring and computer hardware/software.
- E. All cabinetry and countertops if required.

## 1.3 DEFINITIONS

- A. "Supply" is designated herein to mean, "provide all labor, specified and required materials to provide Owner with a complete and professional installation."
- B. "Install" is designated herein to mean, "provide all labor and miscellaneous materials required to install specified and required materials in a professional manner."

## 1.4 SUBMITTALS

Government approval is required for submittals with "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01335 SUBMITTAL PROCEDURES:

SD-01 Data

Spare Parts; FIO.

Data lists of spare parts, and tools for each different item of material and equipment specified, after approval of detail drawings not later than 3 months prior to the date of beneficial occupancy. The data shall include a list of parts and supplies, with current unit prices and source of supply and a list of the parts recommended by the manufacturer to be replaced after 3 years of service.

SD-06 Instructions

Manufacturers' Recommendations; FIO.

Where installation procedures or any part thereof, are required to be in accordance with the recommendations of the manufacturer of the material being installed, printed copies of these recommendations shall be submitted prior to installation. Installation of the item will not be allowed to proceed until recommendations are received and approved.

Operation and Maintenance Instructions; FIO.

Six copies of operating instructions outlining the step-by-step procedures required for the system operation including description of each subsystem in its operating mode. Instructions shall include the manufacturer's name, service manual, parts list, and a brief description of equipment, components and their basic operating features. Six copies of the maintenance procedures, possible system failures, a troubleshooting guide for repairs and simplified diagrams for the system installed.

#### SD-08 Drawings

Audio System; GA, ED.

Detail drawings include:

- 1) Complete system construction and point to point wiring schematic drawings, including all component values and showing complete number identification of all wire and cable as well as jacks and terminals.
- 2) All panels, plates, and designation strips, including details relating to terminology, engraving, finish and color.
- 3) All custom designed consoles, tables, and carts, support bases and shelves.
- 4) Schematic drawings of all custom components, assemblies and circuitry.
- 5) All equipment modifications.
- 6) Patch panels assignment layout drawings.
- 7) Front mechanical drawings of each equipment rack.
- 8) Mounting details complete with dimensions.
- 9) Catalog specification sheets with complete technical data for each item being furnished. Note any custom modifications. Descriptive sheets for custom equipment.
- 10) All control panel layouts with a description of button functionality.

#### SD-09 Reports

Test Plan; FIO.

Test plan and test procedures for the acceptance tests. The test plan and test procedures shall explain in detail, step-by-step actions and expected results to demonstrate compliance with requirements specified. The procedures shall also explain methods for simulating the necessary conditions of operation to demonstrate system performance.

Acceptance Tests; FIO.

Test reports in booklet form showing all field tests performed to adjust each component and to prove compliance with the specified performance criteria, upon completion and testing of the installed system. The report shall include the manufacturer, model number, and serial number of test equipment used in each test. Each report shall indicate the final position of controls and operating mode of system.

#### 1.5 QUALITY OF MATERIALS AND EQUIPMENT

A. All materials and equipment shall be new and shall meet or exceed the latest published specification of the manufacturer in all respects.

B. The Contractor shall supply the latest model, available at the time of bidding, of each piece of equipment.

#### 1.6 WARRANTY

A. The Contractor shall provide a One (1) Year System Integration Warranty covering all materials and workmanship provided under this specification. The warranty will commence upon the date the Contractor receives, in writing, substantial completion acceptance from an authorized agent of the Owner. Contractor shall warrant the system against defective equipment, workmanship, final design and improper system calibration or adjustments made by the Contractor.

B. All manufacturers' equipment warranties shall be activated in the Owner's name and shall commence on the date of system acceptance. In the case of Contractor-modified equipment, the manufacturer's warranty is normally voided. In such cases the Contractor shall provide the Owner with a warranty equivalent to that of the original manufacturer.

C. All equipment must be installed, aligned and serviced by those installers authorized by said manufacturer to perform those duties. If the Contractor is not authorized by said manufacturer, it is the Contractor's sole responsibility to make the appropriate arrangements and bear all cost and consequences thereof.

#### 1.7 POST ACCEPTANCE OF SOFTWARE CHANGES

A. Contractor shall include 8 hours of additional programming services to be utilized after final acceptance of the system by the Owner. Should the Owner desire to exercise its right to use this time, the Owner will submit a list of specific changes it desires (control panel layout(s) and/or software functionality) in writing to the Contractor. The Owner has up to 60 calendar days following final acceptance to request these changes and the Contractor shall be obligated to have said changes completed within 30

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

calendar days thereafter. If the estimated time to complete these changes exceeds the budgeted time, the Owner will negotiate with the Contractor to achieve either a lesser list of changes or a separate contract for programming services. Contractor shall not use this time to correct blatant bugs in the software; but only for feature, function and performance changes.

## 1.8 SYSTEM DESCRIPTION

A. The purpose of the system is to provide message playback at each visitor station (total of 19 stations) located along the Visitor Overlook Pedway and canopy area.. As visitor(s) approach the stations a message (length undetermined) shall either be triggered by button or motion detector (Owner must determine method of trigger and message length at the time of bid). Message is played back over a weatherproof speaker that is built into each visitor station.

B. Messages are recorded by owner onto a multi-channel digital recorder system. System must allow the owner to change messages easily and regularly if desired.

C. System shall also be utilized as a public address system when desired. All speakers in visitor stations and canopy area shall be utilized when public address function is activated.

D. Public Address function of system shall also include playback of CD's, wireless handheld and lavalier microphone system, and two auxiliary microphone hookups. Auxiliary microphone hookups shall be provided (1) in canopy area and (1) in equipment rack.

E. Equipment rack shall be mounted in Rm 8 of main building. Rack must be wall mounted or free standing with security door and keyed lock.

F. Control System - The system shall utilize a custom control system with a control panel located in the equipment rack. Control system shall provide system configuration choices, i.e. Message or PA mode, volume control, power on/off, message record function, etc. Control system shall also detect button pushes or motion detection at visitor stations to activate message repeater system.

## 1.9 CODE COMPLIANCE

All work, specified herein or shown on the drawings shall conform to the applicable requirements of NFPA Code No. 70, National Electric Code, ANSI C2 National Electrical Safety Code, and SECTION CEGS 16415, ELECTRICAL WORK,



## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

INTERIOR.

**\*1**

1.10 NOT USED

**\*1**

1.10 PAYMENT

No separate payment or direct payment will be made for the work covered under this section. Any such work shall be considered incidental to the applicable bid item to which the work pertains.

## PART 2 PRODUCTS

## 2.1 SYSTEM COMPONENTS

A. Items listed hereafter are general descriptive components that the Owner substantially believes accurately represents the standard of quality, design, specification, features and functionality that are desired to be included in the system purchased.

B. The reference list below does not constitute a complete equipment list for the system. The Contractor is responsible for thoroughly reading and understanding these specifications and associated conceptual system drawing to obtain a full understanding of the intended capabilities of the system. Contractor will identify all unspecified items that are necessary to install, mount, terminate and interconnect system components and shall include these items as part of their base-bid. No claim for additional payment will be considered for such items.

## 2.2 EQUIPMENT LIST

- 1 Wall mounted equipment rack (to be mounted in main building)
- 1 Multi-channel digital message repeater / recording system
- 1 Audio matrix router system
- 1 UHF Wireless Handheld / Lavalier Microphone Package
- 1 Multi Disc CD Player
- 1 Multi Channel 70v Amplifier System
- 1 Multi Channel audio mixer
- 1 2 Channel 70v Amplifier for Canopy Area
- 19 Weatherproof Speaker (w/70v transformer) and grille, backbox and backbox assembly for canopy area and each visitor station.
- 1 Custom Control system and control panel
- 1 Miscellaneous Installation cabling and materials.

## 2.3 CABLING

A. All wire and cable shall be supplied and installed according to prevailing national and local ordinances. Where code dictates a cable specification more stringent than those of the reference cables included herein, the more stringent requirement shall apply.

B. If cables of greater specifications are required (such as may be necessary for long cable runs) to achieve proper technical performance of the system the Contractor shall be responsible for supplying and

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

installing said cable without claim for any additional funds from the Owner.

C. Where cables are required but a reference specification is not given, the Contractor shall be responsible for selecting the most appropriate cable for the application.

## PART 3 EXECUTION

## 3.1 INSTALLATION

1) Installation shall include the unloading, uncrating, setting in place, fastening to walls, floors, ceilings, counters, or other structures where required, equipment alignment and adjustment and all other work whether or not expressly stated which is necessary to result in a complete, fully tested and operational system.

2) Installation shall be performed in accordance with the applicable standards, requirements and recommendations of the Occupational Safety and Health Act, the current edition of the National Electric Code and all Federal, State and Local authorities having jurisdiction.

3) During installation, up to the date of final acceptance, the Contractor shall be obligated to protect the finished and unfinished work, as well as any Owner Furnished Equipment against damage. In the event of damage, the Contractor shall make repairs at no cost to the Owner. Sequence of main paragraphs should follow the sequence provided in the document GUIDANCE FOR THE PREPARATION OF CORPS OF ENGINEERS GUIDE SPECIFICATIONS (CEGS) to the extent those titles are appropriate for the subject matter involved. When the titles provided are not appropriate, care should still be taken to maintain the same subject matter sequence as provided in the guidance document.

## 3.2 PHYSICAL INSTALLATION

1) All rack-mounted hardware shall be installed using star-post security screws. Equipment shall be installed in the racks using the manufacturer's rack mount or third party custom rackmount.

2) All equipment shall be firmly secured in place unless requirements of portability dictate otherwise. Fasteners and supports shall be adequately engineered to support their loads with a safety factor of at least three. All boxes, equipment, etc., shall be plumb and square.

3) Multiple equipment racks and consoles shall be bolted together to form one unit. Units subject to tipping shall be bolted to the floor, to the walls, or to other units as required for stability. Movable units subject to tipping shall be provided with removable fasteners in lieu of permanent bolts or removable ballast as may be required for reasonable stability in operation.

4) In the installation of equipment and cables, consideration shall be given not only to operational efficiency, but also to overall aesthetic factors.

### 3.3 CABLES AND WIRING

- 1) Cables are to be labeled at both ends with pre-printed; computer generated self-laminating wire markers. There shall be no unmarked cables at any place in the system. Wire numbers shall correspond to the pre-assigned wire numbers included in contractors wiring diagram and any deviations shall be modified on the as-built drawings.
- 2) All cables are to be installed plum and square to building surfaces. All cables installed above the ceiling must be installed and secured and shall not be permitted to lie directly on the ceiling, ceiling tiles or grid work. Cables shall be routed through bridle rings or similar cable support devices that are attached directly to the rigid building surfaces. Cables MAY NOT be attached to ceiling hanger wires.
- 3) All cables are to be continuous and without splices. All cables shall be cut to the length dictated by the run. All cables shall be provided with a service loop of appropriate length.
- 4) All cables shall be grouped according to the signals being carried to reduce signal contamination. Separate groups shall be formed for the following:
  - Power cables
  - Control cables
  - Audio cables carrying signals less than -20 dBm
  - Audio cables carrying signals between -20 dBm and +20 dBm
  - Audio cables carrying signals above +20 dBm
- 5) All inter-rack cabling shall be neatly strapped, dressed and adequately supported. As a general practice, all power cables, control cables, and high level cables shall be run on the left side of an equipment rack as viewed from the rear. All other cables shall be run on the right side of an equipment rack, viewed from the rear.
- 6) The Contractor shall not install cables with a bend radius less than that recommended by the manufacturer or any codes associated with that cable.

### 3.4 PATCH PANELS

- 1) All patch panels shall be wired so that signal 'sources' (outputs from) appear on the upper row of a row pair; and all 'loads' (inputs to) appear on the lower row of a row pair.
- 2) All audio patch panel designation strips shall utilize descriptive information.

### 3.5 GROUNDING

- 1) Because of the great number of variations possible in grounding systems, it shall be the responsibility of the Contractor to follow good engineering and safety practices to minimize crosstalk and to maximize

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

signal-to-noise ratio in the audio, control and systems.

2) All audio cable shields shall be grounded at one point only. For inter and intra-rack wiring this requires the shield to be connected at one end only. For ungrounded, portable equipment such as microphones, the shield is to be connected at both ends but grounded at the receive end only.

### 3.6 PERFORMANCE STANDARDS

A. The system shall be installed, adjusted and equalized for a high level of performance acceptable to the Owner.

B. The system shall be adjusted to provide the required listening levels throughout the coverage area.

C. The system shall be free of audio distortion, clipping, hum, buzz, hiss, radio frequency interference and similar objectionable artifacts.

D. All remote and local controls shall function as required and the system shall be adjusted and marked for nominal settings of adjustable controls wherever feasible and wherever consistent with the manufacturer's installation and operating instructions.

E. All individual items of equipment installed on this project shall meet or exceed the manufacturer's published specifications. Unless restricted by the published specifications of a particular piece of equipment, or unless otherwise required under these detailed specifications, the following overall system performance standards shall be met:

#### 1) Audio

Line Level Electrical Signal-to-Noise (including crosstalk and hum)... better than 77 dB, unweighted 20Hz to 20KHz

Ref: Nominal Line Input Levels (greater than or equal to +18dB below system clip).

Two Channels properly gain staged, terminated and routed through system

Total Harmonic Distortion... less than .5% from 20Hz to 20KHz

Ref: Nominal Operating Level.

Electronic Frequency Response... plus or minus 3.0dB, 20Hz to 20KHz.

Mic-Level Electrical Signal-to-Noise (including crosstalk and hum)... better than 60 dB, unweighted 20Hz to 20KHz Ref: Nominal Mic Input Level (greater than or equal to +18dB below system clip).

Total Harmonic Distortion... less than .5% from 20Hz to 20KHz

Ref: Nominal Operating Level.

Electronic Frequency Response... plus or minus 3.0dB, 20Hz to 20KHz.

### 3.7 TESTING

A. Before acceptance tests are scheduled, the Contractor shall perform a full system checkout. The Contractor shall furnish all required test

## McALPINE LOCK REPLACEMENT PROJECT, LOCK CONSTRUCTION

equipment and shall perform all work necessary to determine and/or modify performance of the system to meet the requirements of the specification. This work shall include the following:

- 1) Test all audio systems for compliance with the performance standards.
- 2) Check all control functions, from all controlling devices to all controlled devices, for proper operation.
- 3) Adjust, balance and align all equipment for optimum quality and to meet the manufacturer's published specifications. Establish and mark normal settings for all level controls.

B. System acceptance test will not be performed until the Contractor's system checkout has been completed. The system acceptance tests will be supervised by the Owner and will consist of the following;

- 1) A physical inventory will be taken of all equipment on site and will be compared to equipment lists in the contract documents.
- 2) The Contractor shall demonstrate the operation of all system equipment.
- 3) Both subjective and objective tests will be required by the Owner to determine compliance with the specifications. The Contractor shall be responsible for providing all necessary test equipment.
- 4) All final as-built documentation will be on hand consisting of two complete sets to be delivered to the Owner at this time.
- 5) In the event of further required adjustments, or the finding of defective equipment requiring repair and/or replacement, tests may be suspended or continued at the option of the Owner.

-- End of Section --

(ER 415 1-10)

SPECIFICATION SECTION  
**03151**

## McAlpine Lock Repl. Phase 2 specs

[illegible]

(ER 415 1-10)

SPECIFICATION SECTION

**05400**

## McAlpine Lock Repl. Phase 2 specs

[illegible]

CONTRACT NO.

SPECIFICATION SECTION

15010

[illegible]



(ER 415 1-10)

SPECIFICATION SECTION  
**16920**

## McAlpine Lock Repl. Phase 2 specs

[illegible]

GENERAL DECISION KY020027 04/05/02 KY27  
General Decision Number KY020027

Superseded General Decision No. KY010027

State: Kentucky

Construction Type:  
HEAVY  
HIGHWAY

County(ies):

ANDERSON	GALLATIN	MERCER
BATH	GRANT	MONTGOMERY
BOURBON	GRAYSON	NELSON
BOYD	GREENUP	NICHOLAS
BOYLE	HARDIN	OLDHAM
BRACKEN	HARRISON	OWEN
BRECKINRIDGE	HENRY	ROBERTSON
BULLITT	JEFFERSON	ROWAN
CARROLL	JESSAMINE	SCOTT
CARTER	LARUE	SHELBY
CLARK	LEWIS	SPENCER
ELLIOTT	MADISON	TRIMBLE
FAYETTE	MARION	WASHINGTON
FLEMING	MASON	WOODFORD
FRANKLIN	MEADE	

Heavy and Highway Construction Projects

Modification Number	Publication Date
0	03/01/2002
1	04/05/2002

COUNTY(ies):

ANDERSON	GALLATIN	MERCER
BATH	GRANT	MONTGOMERY
BOURBON	GRAYSON	NELSON
BOYD	GREENUP	NICHOLAS
BOYLE	HARDIN	OLDHAM
BRACKEN	HARRISON	OWEN
BRECKINRIDGE	HENRY	ROBERTSON
BULLITT	JEFFERSON	ROWAN
CARROLL	JESSAMINE	SCOTT
CARTER	LARUE	SHELBY
CLARK	LEWIS	SPENCER
ELLIOTT	MADISON	TRIMBLE
FAYETTE	MARION	WASHINGTON
FLEMING	MASON	WOODFORD
FRANKLIN	MEADE	

\* BRIN0004D 04/01/2002

	Rates	Fringes
BRECKINRIDGE COUNTY:		
BRICKLAYERS	24.15	6.55

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\* BRKY0001G 06/01/2001

	Rates	Fringes
BULLITT, CARROLL, GRAYSON, HARDIN, HENRY, JEFFERSON, LARUE, MARION, MEADE, NELSON, OLDHAM, SHELBY, SPENCER & TRIMBLE COUNTIES:		

BRICKLAYERS	20.00	5.43
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\* BRKY0002F 01/01/2002

	Rates	Fringes
BRACKEN, GALLATIN, GRANT, MASON & ROBERTSON COUNTIES:		

BRICKLAYERS	22.26	6.89
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\* BRKY0007D 06/01/2001

	Rates	Fringes
BOYD, CARTER, ELLIOTT, FLEMING, GREENUP, LEWIS & ROWAN COUNTIES:		

BRICKLAYERS	23.04	8.32
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\* BRKY0017D 06/01/2001

	Rates	Fringes
ANDERSON, BATH, BOURBON, BOYLE, CLARK, FAYETTE, FRANKLIN, HARRISON, JESSAMINE, MADISON, MERCER, MONTGOMERY, NICHOLAS,  OWEN, SCOTT, WASHINGTON & WOODFORD COUNTIES:		

BRICKLAYERS	18.75	5.55
LAYOUT MEN	19.00	5.55
REFRACTORY/ACID BRICK/GLASS	19.25	5.55

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CARP0064A 07/01/2001

	Rates	Fringes
CARPENTERS	20.70	5.68
PILEDRIVERMEN	20.95	5.68
DIVERS	31.425	5.68

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CARP1031P 06/01/2001

	Rates	Fringes
ANDERSON, BATH, BOURBON, BOYLE, CLARK, FAYETTE, FRANKLIN, HARRISON, JESSAMINE, MADISON, MERCER, MONTGOMERY, NICHOLAS, OWEN, SCOTT & WOODFORD COUNTIES:		

MILLWRIGHTS	19.34	8.58
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CARP1031Q 06/01/2001

	Rates	Fringes
BOYD, CARTER, ELLIOTT, FLEMING, GREENUP, LEWIS, MASON, ROBERTSON		

& ROWAN COUNTIES:

MILLWRIGHTS	20.60	13.05
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CARP1031R 06/01/2001

	Rates	Fringes
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BRECKINRIDGE, BULLITT, CARROLL, GALLATIN, GRAYSON, HARDIN, HENRY,  
JEFFERSON, LARUE, MARION, MEADE, NELSON, OLDHAM, SHELBY,  
SPENCER, TRIMBLE & WASHINGTON COUNTIES:

MILLWRIGHTS	21.86	9.58
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CARP1066D 09/01/1999

	Rates	Fringes
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BRACKEN & GRANT COUNTIES:

MILLWRIGHTS	21.90	7.92
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ELEC0212H 05/28/2001

	Rates	Fringes
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BRACKEN, GALLATIN & GRANT COUNTIES:

ELECTRICIANS	23.53	7.20
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ELEC0212Q 11/01/2000

	Rates	Fringes
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BRACKEN, GALLATIN & GRANT COUNTIES:

SOUND COMMUNICATIONS:

Installer	18.00	3.475
Cable Puller	9.00	2.64

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ELEC0317L 05/30/2001

	Rates	Fringes
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BOYD, CARTER, ELLIOTT & ROWAN COUNTIES:

ELECTRICIANS:

Electricians	23.11	11.04
Cable Splicers	24.27	11.08

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ELEC0369J 06/01/2001

	Rates	Fringes
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ANDERSON, BATH, BOURBON, BOYLE, BRECKINRIDGE, BULLITT, CARROLL,  
CLARK, FAYETTE, FRANKLIN, GRAYSON, HARDIN, HARRISON, HENRY,  
JEFFERSON, JESSAMINE, LARUE, MADISON, MARION, MEADE, MERCER,  
MONTGOMERY, NELSON, NICHOLAS, OLDHAM, OWEN, ROBERTSON, SCOTT,  
SHELBY, SPENCER, TRIMBLE, WASHINGTON & WOODFORD COUNTIES:

ELECTRICIANS	23.50	7.73
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ELEC0575B 01/02/2002

	Rates	Fringes
FLEMING, GREENUP, LEWIS & MASON COUNTIES:		

ELECTRICIANS	25.95	7.31
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\* ENGI0181Y 01/01/2002

	Rates	Fringes
POWER EQUIPMENT OPERATORS:		
GROUP 1	20.85	8.40
GROUP 2	18.43	8.40
GROUP 3	18.81	8.40
GROUP 4	18.17	8.40

POWER EQUIPMENT OPERATOR CLASSIFICATIONS

GROUP 1 - A-Frame Winch Truck; Auto Patrol; Backfiller; Batcher Plant; Bituminous Paver; Bituminous Transfer Machine; Boom Cat; Bulldozer; Mechanic; Cableway; Carry-All Scoop; Carry Deck Crane; Central Compressor Plant; Clamshell; Concrete Mixer (21 cu. ft. or Over); Concrete Paver; Truck-Mounted Concrete Pump; Core Drill; Crane; Crusher Plant; Derrick; Derrick Boat; Ditching & Trenching Machine; Dragline; Dredge Operator; Dredge Engineer; Elevating Grader & Loaders; Grade-All; Gurries; Heavy Equipment Robotics Operator/Mechanic; High Lift; Hoe-Type Machine; Hoist (Two or More Drums); Hoisting Engine (Two or More Drums); Horizontal Directional Drill Operator; Hydrocrane;

Hyster; KeCal Loader; LeTourneau; Locomotive; Mechanic; Mechanically Operated Laser Screed; Mechanic Welder; Mucking Machine; Motor Scraper; Orangepeel Bucket; Piledriver; Power Blade; Pumpcrete; Push Dozer; Rock Spreader, attached to equipment; Rotary Drill; Roller (Bituminous); Scarifier; Scoopmobile; Shovel; Side Boom; Subgrader; Tailboom; Telescoping Type Forklift; Tow or Push Boat; Tower Crane (French, German & other types); Tractor Shovel; Truck Crane; Tunnel Mining Machines, including Moles, Shields or similar types of Tunnel Mining Equipment

GROUP 2 - Air Compressor (Over 900 cu. ft. per min.); Bituminous Mixer; Boom Type Tamping Machine; Bull Float; Concrete Mixer (Under 21 cu. ft.); Dredge Engineer; Electric Vibrator; Compactor/Self-Propelled Compactor; Elevator (One Drum or Buck Hoist); Elevator (When used to Hoist Building Material); Finish Machine; Firemen & Hoist (One Drum); Flexplane; Forklift (Regardless of Lift Height); Form Grader; Joint Sealing Machine; Outboard Motor Boat; Power Sweeper (Riding Type); Roller (Rock); Ross Carrier; Skid Mounted or Trailer Mounted Concrete Pump; Switchman or Brakeman; Throttle Valve Person; Tractair & Road Widening Trencher; Tractor (50 H.P. or Over); Truck Crane Oiler; Tugger; Welding Machine; Well Points; & Whirley Oiler

GROUP 3 - Greaser on Grease Facilities servicing Heavy

Equipment

GROUP 4 - Bituminous Distributor; Burlap & Curing Machine;  
Cement Gun; Concrete Saw; Conveyor; Deckhand Oiler;  
Grout Pump; Hydraulic Post Driver; Hydro Seeder; Mud Jack;  
Oiler; Paving Joint Machine; Power Form Handling Equipment;  
Pump; Roller (Earth); Steerman; Tamping Machine; Tractor  
(Under 50 H.P.); & Vibrator

CRANES WITH BOOMS 150 ft. & Over (Including JIB) \$.50 Premium

EMPLOYEES ASSIGNED TO WORK BELOW GROUND LEVEL ARE TO BE PAID 10%  
ABOVE BASIC WAGE RATE. THIS DOES NOT APPLY TO OPEN CUT WORK.

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IRON0044I 06/01/2001

	Rates	Fringes
BOURBON (Northern third, including Townships of Jackson, Millersburg, Ruddel Mills & Shawhan);		

CARROLL (Eastern third, including the Township of Ghent);

FLEMING (Western part, excluding Townships of Beechburg, Colfax,  
Elizaville, Flemingsburg, Flemingsburg Junction, Foxport, Grange  
City, Hillsboro, Hilltop, Mount Carmel, Muses Mills, Nepton,  
Pecksridge, Plummers Landing, Plummers Mill, Poplar Plains,  
Ringos Mills, Tilton & Wallingford);

MASON (Western two-thirds, including Townships of Dover,  
Lewisburg, Mays Lick, Maysville, Minerva, Moranburg,

Murphysville, Ripley, Sardis, Shannon, South Ripley &  
Washington);

NICHOLAS (Townships of Barefoot, Barterville, Carlisle,  
Ellisville, Headquarters, Henryville, Morningglory, Myers &  
Oakland Mills);

OWEN (Townships of Beechwood, Bromley, Fairbanks, Holbrook,  
Jonesville, Long Ridge, Lusby's Mill, New, New Columbus,  
New Liberty, Owenton, Poplar Grove, Rockdale, Sanders, Teresita  
& Wheatley);

SCOTT (Northern two-thirds, including Townships of Biddle, Davis,  
Delaplain, Elmsville, Longlick, Muddy Ford, Oxford, Rogers Gap,  
Sadieville, Skinnersburg & Stonewall) &

BRACKEN, GALLATIN, GRANT, HARRISON & ROBERTSON COUNTIES:

IRONWORKERS:

Structural	22.60	10.63
Fence Erector	20.34	10.63

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IRON0070J 06/01/2001

	Rates	Fringes
BOURBON (Southern two-thirds, including Townships of Austerlity,		

Centerville, Clintonville, Elizabeth, Hutchison, Littlerock,  
North Middletown & Paris);

CARROLL (Western two-thirds, including Townships of Carrollton,  
Easterday, English, Locust, Louis, Prestonville & Worthville);

CLARK (Western two-thirds, including Townships of Becknerville,  
Flanagan, Ford, Pine Grove, Winchester & Wyandotte);

OWEN (Eastern eighth, including Townships of Glenmary, Gratz,  
Monterey, Perry Park & Tacketts Mill);

SCOTT (Southern third, including Townships of Georgetown, Great  
Crossing, Newtown, Stampling Ground & Woodlake);

ANDERSON, BOYLE, BRECKINRIDGE, BULLITT, FAYETTE, FRANKLIN,  
GRAYSON, HARDIN, HENRY, JEFFERSON, JESSAMINE, LARUE, MADISON,  
MARION, MEADE, MERCER, NELSON, OLDHAM, SHELBY, SPENCER, TRIMBLE,  
WASHINGTON & WOODFORD COUNTIES:

IRONWORKERS	22.26	10.62
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IRON0372F 06/01/2001

	Rates	Fringes
BOURBON (Northern third, including Townships of Jackson, Millersburg, Ruddel Mills & Shawhan);		

CARROLL (Eastern third, including the Township of Ghent);

FLEMING (Western part, Excluding Townships of Beechburg, Colfax,  
Elizaville, Flemingsburg, Flemingsburg Junction, Foxport, Grange  
City, Hillsboro, Hilltop, Mount Carmel, Muses Mills, Nepton,  
Pecksville, Plummers Landing, Plummers Mill, Poplar Plains,  
Ringos Mills, Tilton & Wallingford);

MASON (Western two-thirds, including Townships of Dover,  
Lewisburg, Mays Lick, Maysville, Minerva, Moranburg,  
Murphysville, Ripley, Sardis, Shannon, South Ripley &  
Washington);

NICHOLAS (Townships of Barefoot, Barterville, Carlisle,  
Ellisville, Headquarters, Henryville, Morningglory, Myers &  
Oakland Mills);

OWEN (Townships of Beechwood, Bromley, Fairbanks, Holbrook,  
Jonesville, Long Ridge, Lusby's Mill, New, New Columbus,  
New Liberty, Owenton, Poplar Grove, Rockdale, Sanders, Teresita  
& Wheatley);

SCOTT (Northern two-thirds, including Townships of Biddle, Davis,  
Delaplain, Elmville, Longlick, Muddy Ford, Oxford, Rogers Gap,  
Sadieville, Skinnersburg & Stonewall);

BRACKEN, GALLATIN, GRANT, HARRISON & ROBERTSON COUNTIES:

IRONWORKERS, Reinforcing:

Up to & including 25-mile radius of Hamilton County, Ohio		
Courthouse	21.86	10.22
Beyond 25-mile radius of Hamilton County, Ohio Courthouse	22.00	10.22

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IRON0769G 06/01/2001

	Rates	Fringes
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CLARK (Eastern third, including Townships of Bloomingdale, Hunt,  
Indian Fields, Kiddville, Loglick, Rightangele & Thomson);

FLEMING (Townships of Beechburg, Colfax, Elizaville,  
Flemingsburg, Flemingsburg Junction, Foxport, Grange City,  
Hillsboro, Hilltop, Mount Carmel, Muses Mills, Nepton,  
Pecksridge, Plummers Landing, Plummers Mill, Poplar Plains,  
Ringos Mills, Tilton & Wallingford);

MASON (Eastern third, including Townships of Helena, Marshall,  
Orangeburg, Plumville & Springdale);

NICHOLAS (Eastern eighth, including the Township of Moorefield  
Sprout);

BATH, BOYD, CARTER, ELLIOTT, GREENUP, LEWIS, MONTGOMERY & ROWAN  
COUNTIES:

IRONWORKERS:

ZONE 1	24.20	10.87
ZONE 2	24.60	10.87
ZONE 3	26.60	10.87

ZONE 1 - Up to 10 mi. radius of union hall, Ashland, Ky., 1643  
Greenup Avenue

ZONE 2 - 10 to 50 mi. radius of union hall;

ZONE 3 - 50 mi. radius and beyond

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LABO0189C 07/01/2001

	Rates	Fringes
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LABORERS:

GROUP 1	16.41	6.18
GROUP 2	16.66	6.18
GROUP 3	16.71	6.18
GROUP 4	17.31	6.18

LABORERS CLASSIFICATIONS

GROUP 1 - Aging & Curing of Concrete; Asbestos Abatement Worker;  
Asphalt Plant; Asphalt; Batch Truck Dump; Carpenter Tender;  
Cement Mason Tender; Cleaning of Machines; Concrete;  
Demolition; Dredging; Environmental - Nuclear, Radiation, Toxic  
& Hazardous Waste - Level D; Flagperson; Grade Checker; Hand  
Digging & Hand Back Filling; Highway Marker Placer;  
Landscaping, Mesh Handler & Placer; Puddler; Railroad; Rip-rap



& Grouter; Right-of-Way; Sign, Guard Rail & Fence Installer;  
Signal Person; Sound Barrier Installer; Storm & Sanitary Sewer;  
Swamper; Truck Spotter & Dumper; & Wrecking of Concrete Form

GROUP 2 - Batter Board Man (Sanitary & Storm Sewer); Brickmason  
Tender; Mortar Mixer Operator; Burner & Welder; Bushhammer;  
Chain Saw Operator; Concrete Saw Operator; Deckhand Scow Man;  
Dry Cement Handler; Environmental - Nuclear, Radiation, Toxic  
& Hazardous Waste - Level C; Forklift Operator for Masonary;  
Form Setter; Green Concrete Cutting; Hand Operated Grouter &  
Grinder Machine Operator; Jackhammer; Pavement Breaker; Paving  
Joint Machine; Pipelayer; Plastic Pipe Fusion; Power Driven  
Georgia Buggy & Wheel Barrow; Power Post Hole Digger; Precast  
Manhole Setter; Walk-Behind Tamper; Walk-Behind Trencher; Sand  
Blaster; Concrete Chipper; Surface Grinder; Vibrator Operator;  
& Wagon Driller

GROUP 3 - Air Track Driller; Asphalt Luteman & Raker; Gunnite  
Nozzleman; Gunnite Operator & Mixer; Grout Pump Operator;  
Powderman & Blaster; Side Rail Setter; Rail Paved Ditch; Screw  
Operator; Tunnel (Free Air); & Water Blaster

GROUP 4 - Caisson Worker (Free Air); Cement Finisher;  
Environmental - Nuclear, Radiation, Toxic & Hazardous Waste -  
Levels A & B; Miner & Driller (Free Air); Tunnel Blaster; &  
Tunnel Mucker (Free Air)

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PAIN0012F 06/01/2001

	Rates	Fringes
BATH, BOURBON, BOYLE, CLARK, FAYETTE, FLEMING, FRANKLIN, HARRISON, JESSAMINE, MADISON, MERCER, MONTGOMERY, NICHOLAS, ROBERTSON, SCOTT & WOODFORD COUNTIES:		

PAINTERS:

Brush; Roll; Spray; Sandblasting; Steam Cleaning; Steeplejack Work; Lead Abatement; & Coal Tar	16.81	2.60
Bridge/Equipment Tender and/or Containment Builder	17.96	2.60
Swing & Scaffold Bridges; Structural Steel; Open Acid Tanks; High Tension Electrical Equipment; & Hot Pipes	21.00	2.60

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\* PAIN0012T 06/09/2001

	Rates	Fringes
BRACKEN, GALLATIN, GRANT, MASON & OWEN COUNTIES:		

PAINTERS:

Elevated Tanks	22.05	4.70
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(HEAVY & HIGHWAY BRIDGES - GUARDRAILS-LIGHTPOLES-

STRIPING):

Bridge/Equipment Tender and/or Containment Builder	18.74	4.70
Brush & Roller	21.05	4.70
Spray	21.55	4.70
Sandblasting & Hopper Tender; Water Blasting	21.80	4.70
Bridges when highest point of clearance is 60 feet or more; & Lead Abatement Projects	22.05	4.70
Sandblasting, Hopper Tender, Waterblasting (Bridges when highest point of clearance is 60 feet or more)	22.80	4.70

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\* PAIN0118D 05/01/2001

	Rates	Fringes
ANDERSON, BRECKINRIDGE, BULLITT, CARROLL, GRAYSON, HARDIN, HENRY, JEFFERSON, LARUE, MARION, MEADE, NELSON, OLDHAM, SHELBY, SPENCER, TRIMBLE & WASHINGTON COUNTIES:		

PAINTERS:

Brush	16.67	5.37
Abrasive Blaster; Fireproofing; Lead Abatement; Spray; & Waterblasting 4000 PSI and Above	17.17	5.37

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PAIN1072D 06/01/2001

	Rates	Fringes
BOYD, CARTER, ELLIOTT, GREENUP, LEWIS & ROWAN COUNTIES:		

PAINTERS:

Bridges	22.71	7.31
All Other Work	19.00	7.31

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PLUM0107F 08/01/2001

	Rates	Fringes
BRECKINRIDGE, BULLITT, CARROLL (Western Half), FRANKLIN (Western three-fourths), GRAYSON, HARDIN, HENRY, JEFFERSON, LARUE, MARION, MEADE, NELSON, OLDHAM, SHELBY, SPENCER, TRIMBLE & WASHINGTON COUNTIES:		

PLUMBERS; GAS FITTERS:

Plumbing contracts less than \$150,000.00	19.17	5.97
All Other Plumbing contracts	24.15	5.97

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\* PLUM0248C 06/01/2001

	Rates	Fringes
BOYD, CARTER, ELLIOTT, GREENUP, LEWIS & ROWAN COUNTIES:		

PLUMBERS & STEAMFITTERS	22.47	11.70
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PLUM0392H 06/01/2001

Rates Fringes  
BRACKEN, CARROLL (Eastern Half), GALLATIN, GRANT, MASON, OWEN &  
ROBERTSON COUNTIES:

	Rates	Fringes
PIPEFITTERS & PLUMBERS	25.50	7.53

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PLUM0452C 11/01/2001

Rates Fringes  
ANDERSON, BATH, BOURBON, BOYLE, CLARK, FAYETTE, FLEMING,  
FRANKLIN (Eastern one-fourth), HARRISON, JESSAMINE, MADISON,  
MERCER, MONTGOMERY, NICHOLAS, SCOTT & WOODFORD COUNTIES:

PIPEFITTERS & PLUMBERS:

Projects over 1 1/2 million dollars in piping contracts:

	Rates	Fringes
ZONE 1	22.15	6.87
ZONE 2	23.15	6.87

Projects under 1 1/2 million dollars in piping contracts:

	Rates	Fringes
ZONE 1	18.77	6.87
ZONE 2	19.77	6.87

ZONE 1 - Within 25 mile radius of Fayette County Courthouse

ZONE 2 - Beyond 25 mile radius of Fayette County Courthouse

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PLUM0522D 08/01/2001

Rates Fringes  
BRECKINRIDGE, BULLITT, CARROLL (Western Half), FRANKLIN (Western  
three-fourths), GRAYSON, HARDIN, HENRY, JEFFERSON, LARUE,  
MARION, MEADE, NELSON, OLDHAM, SHELBY, SPENCER, TRIMBLE &  
WASHINGTON COUNTIES:

	Rates	Fringes
PIPEFITTERS & STEAMFITTERS	25.40	8.23

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SUKY2003A 10/08/2001

Rates Fringes  
TRUCK DRIVERS:  
GROUP 1 16.57 7.34  
GROUP 2 16.68 7.34  
GROUP 3 16.86 7.34  
GROUP 4 16.96 7.34

TRUCK DRIVER CLASSIFICATIONS

GROUP 1 - Mobile Batch Truck Tender

GROUP 2 - Greaser; Tire Changer; & Mechanic Tender

GROUP 3 - Single Axle Dump; Flatbed; Semi-trailer or Pole  
Trailer when used to pull building materials and equipment;  
Tandem Axle Dump; Distributor; Mixer; & Truck Mechanic

GROUP 4 - Euclid & Other Heavy Earthmoving Equipment & Lowboy;

Articulator Cat; 5-Axle Vehicle; Winch & A-Frame when used in transporting materials; Ross Carrier; Forklift when used to transport building materials; & Pavement Breaker

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WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

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Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29 CFR 5.5(a)(1)(v)).

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In the listing above, the "SU" designation means that rates listed under that identifier do not reflect collectively bargained wage and fringe benefit rates. Other designations indicate unions whose rates have been determined to be prevailing.

#### WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

- \* an existing published wage determination
- \* a survey underlying a wage determination
- \* a Wage and Hour Division letter setting forth a position on a wage determination matter
- \* a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour Regional Office for the area in which the survey was conducted because those Regional Offices have responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations  
Wage and Hour Division  
U. S. Department of Labor  
200 Constitution Avenue, N. W.  
Washington, D. C. 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator

U.S. Department of Labor  
200 Constitution Avenue, N. W.  
Washington, D. C. 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board  
U. S. Department of Labor  
200 Constitution Avenue, N. W.  
Washington, D. C. 20210

4.) All decisions by the Administrative Review Board are final.  
END OF GENERAL DECISION